

Hexham TSF Surface and Groundwater Monitoring Plan

1 February 2023



Plan Approval Table

Position	Name	Signature	Date
Regional Maintenance Manager	David Price		01/02/2023

Revision History

Rev	Date	Author	Comments
1	29/09/14	Heath Anderson	S1 Draft for Agency review
2	29/10/14	Heath Anderson	S1 Agency comments addressed
3	06/11/14	Heath Anderson	S1 Updated for DPE issue
4	13/03/15	Heath Anderson	S2 Draft review (Internal)
4	18/03/15	Heath Anderson	S2 Draft for Agency review
5	31/03/15	Heath Anderson	S2 Final for DPE issue
6	18/02/16	Heath Anderson	DIL and WWTP amendments for DPE issue
7	11/10/17	Heath Anderson	Minor revisions
8	07/01/19	Harry Egan	Revision following IEA
9	19/05/20	Harry Egan	Inclusion of turning angle details
10	30/03/21	Harry Egan	Update of Section 3.1
11	01/02/23	Harry Egan	Mod 2 Update

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Glossary

Term	Definitions
ANZECC	Australian and New Zealand Environment and Conservation Council
the Approval	State Significant Infrastructure MP07_0171 MOD 1
Aurizon	Aurizon Operations Pty Ltd
CWR	Coal Washery Reject
DAF	Dissolved aeration floatation
DPE	Department of Planning and Environment
EPL	Environmental Protection Licence
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
OEMP	14-PLA-0004-HEX Aurizon Hexham TSF OEMP
PAH	Poly Aromatic Hydrocarbon
PASS	Potential acid sulphate soils
SGMP	Surface and Groundwater Monitoring Plan
the Site	Hexham Train Support Facility
SoC	Statement of Commitments
SSI	State Significant Infrastructure
TPH	Total Petroleum Hydrocarbon
UST	Underground storage tank

1.0 Introduction

1.1 Site Description

The Aurizon Operations Pty Ltd (Aurizon) Hexham Train Support Facility (the Site) has a total area of 255ha and is located at Hexham approximately 16km north-west of the Newcastle Central Business District.

The Site shares borders with the Main Northern Railway and Pacific Highway to the east and the New England Highway to the north. To the south and west rural properties and the Hexham Swamp Nature Reserve are adjacent. The Site is located within a predominantly industrial setting, with only a small number of residential dwellings within the local vicinity.

The Site's history as a coal handling facility has resulted in the southern portion of the site containing an abandoned rail loop corridor and coal washery reject (CWR). CWR is retained within vegetated stockpiles however it is also present extensively in sub surface deposits. Remediation completed during the construction of the TSF infrastructure has resulted in excavated CWR and Potential Acid Sulphate Soil being stockpiled in the southern portion of the site

Brancourts Manufacturing and Processing Pty Ltd are currently licensed to use a portion of the site for a waste water treatment plant and effluent irrigation area under Environmental Protection Licence (EPL) 816. Effluent is irrigated over the above mentioned CWR stockpiles.

1.2 Operational Activities

The Site provides routine and ad hoc provisioning and maintenance services to outbound locomotives and wagons. The treatment of generated septic and operational waste water is undertaken onsite through the utilisation of a septic treatment plant and dissolved aeration floatation (DAF) plant.

Infrastructure associated with the Site and the above mentioned operational activities are restricted to approximately a 38 hectare portion of the Site and consists of:

- Seven train tracks (10.5 kilometres) parallel to the existing mainline, turning angle and a shunt track;
- a provisioning building, service vehicle garage, warehouse and combined locomotive and wagon maintenance shed;
- operational depot and long term wagon storage;
- surface water management infrastructure including retention basins;
- bulk fuel storage area; and
- A wastewater treatment plant with on-site effluent irrigation and DAF.

1.3 Site Water Quality Context

Historical contamination concerns are summarised as follows:

- Total Petroleum Hydrocarbon (TPH) C10-C36;
- Poly Aromatic Hydrocarbon (PAH);
- Heavy metals;
- CWR; and

- Potential acid sulphate soils (PASS).

The extensive use of CWR as fill in the southern portion of the site associated with the former coal handling preparation plant and rail sidings was identified. Characterisation results returned a mix of positive and negative detections at various sampling locations and depths, including natural soils and in the CWR fill material.

TPH impacts were greatest in the fill used for the construction of Woodlands Close, former underground storage tank (UST) and refuelling areas.

Groundwater was found to be acidic to slightly alkaline and predominately brackish, with the exception of samples from the south to north western boundary which were found to be saline, and north to central eastern boundary which were found to be fresh. Widespread contamination of surface water comprising faecal coliforms, E.coli, nutrients and metals was identified both on and immediately off-site.

Surface and groundwater contamination was deemed to be associated with cattle disturbing historically deposited contaminated sediment and mobilisation of CWR stockpile in situ contaminants from effluent irrigation. Irrigation is undertaken by Brancourts Manufacturing and Processing Pty under Environmental Protection Licence (EPL) 816.

A summary of monitoring results from surface and groundwater determined that the majority of chemical analysis results were generally consistent within Australian and New Zealand Environment and Conservation Council (ANZECC) trigger values.

1.3 Legislative Context

The project was assessed and approved as State Significant Infrastructure (SSI) under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Site approval history is as follows:

- The Site was approved by a delegate of the Minister for Planning and Infrastructure under MP07_0171, dated 10 October 2013.
- The Hexham TSF Turning Angle (the Turning Angle) Modification MP07_0171 MOD 1 (SSI-6090) was approved on the 09 October 2019.
- The Operational Depot and Long-Term Wagon Storage Modification MP07_0171 MOD 2 (SSI-6090) was approved in September 2022.

This Surface and Groundwater Monitoring Plan (SGMP) has been developed and implemented as required by condition C19 of the Approval. A matrix of the conditions of approval and Statement of Commitments (SoC) is included in Appendix A. This matrix identifies where these conditions/commitments have been addressed in the SGMP.

The SGMP has been developed with reference to the Guidelines for the Preparation of Environmental Management Plans (Department of Planning, 2004) and should be read in conjunction with the Aurizon Hexham TSF Operational Environmental Management Plan (OEMP).

1.4 Purpose and Objectives

The SGMP details the environmental management activities to be implemented at the Site required to ensure compliance with relevant regulatory obligations and approvals is achieved and to manage potential onsite and offsite surface and groundwater impacts.

Condition C19(h) of the approval requires:

“details of how interactions with the ARTC Hexham Relief Roads Project and potential cumulative impacts would be monitored and managed;”

This condition relates to assessing cumulative dewatering impacts associated with the simultaneous construction of both the Site and the Relief Roads Project. As construction of both projects has been finalised cumulative impacts and interactions are no longer occurring and as such no longer warrant monitoring or management as part of the OEMP.

2.0 Environmental Monitoring

2.1 Monitoring Network and Program

Surface and groundwater monitoring locations and monitoring frequencies are detailed in Table 1 below with a site layout showing monitoring locations included as Figure 1.

Table 1 - Monitoring Network and Program

Site	Type	Easting	Northing	Monitoring Frequency	Rainfall Event
MW01R	Groundwater	377080	6365705	Quarterly	No
MW301R	Groundwater	376564	6367446	Quarterly	No
MW302R	Groundwater	376918	6366499	Quarterly	No
MW307R	Groundwater	376287	6366363	Quarterly	No
MW308R	Groundwater	376405	6365896	Quarterly	No
MW109	Groundwater	376273	6368095	Quarterly	No
MW106R	Groundwater	376758	6366928	Quarterly	No
MW02	Groundwater	376711	6365816	Quarterly	No
101R	Groundwater	377110	6365956	Quarterly	No
MW108R	Groundwater	376083	6366960	Quarterly	No
MW101R	Groundwater	376282	6367404	Quarterly	No
SW1	Surface Water	376210	6368225	Quarterly	Yes
SW2	Surface Water	375612	6368068	Quarterly	Yes
SW3	Surface Water	375884	6367384	Quarterly	Yes
SW4	Surface Water	376197	6366571	Quarterly	Yes
SW4A	Surface Water	376222	6366553	Quarterly	Yes
SW05	Surface Water	377144	6365655	Quarterly	Yes
SW6	Surface Water	376411	6365873	Quarterly	Yes
SW07	Surface Water	376680	6365799	Quarterly	Yes
SW8	Surface Water	377474	6365420	Quarterly	Yes
SW9	Surface Water	377496	6365387	Quarterly	Yes
SW10	Surface Water	376776	6367600	Quarterly	Yes

Site	Type	Easting	Northing	Monitoring Frequency	Rainfall Event
SW11	Surface Water	375433	6367878	Quarterly	Yes
Basin 1	Surface Water	376205	6367977	Monthly	Yes
Basin 2	Surface Water	376481	6367284	Monthly	Yes
Basin 3	Surface Water	377038	6365758	Monthly	Yes

2.2 Rainfall Event Sampling

Rainfall sampling will be undertaken following rainfall totalling greater than 75mm over a duration of 5 consecutive days or less. Rainfall is measured from the from the Manly Hydraulics Lab, Hexham Bridge, station number 210448 (<http://www.mhl.nsw.gov.au/Site-210448>).

Sampled sites will consist of all surface water and site Basins for the analytical schedule detailed in Table 2.

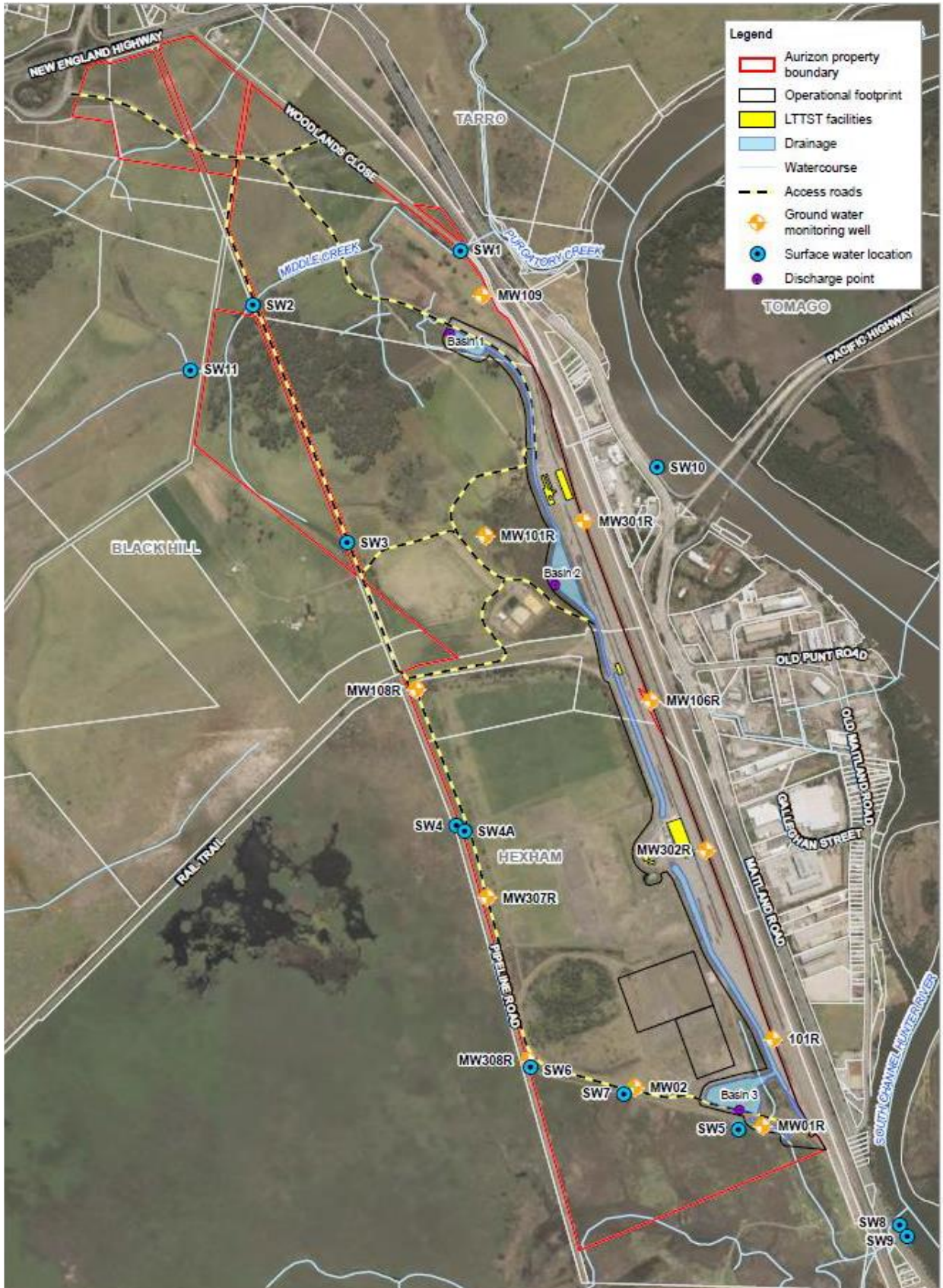


Figure 1 - Surface and Groundwater Monitoring Locations

2.3 Performance Criteria

Performance criteria were developed for Aurizon by Douglas Partners Pty. Ltd. in February 2014¹ utilising information on water quality originating from the site since 1999. Criteria was based on the *Australian and New Zealand Guidelines for Fresh Water Quality 95% species protection levels (ANZECC, 2000)*. The ANZECC 95% investigation levels apply to typical slightly to moderately disturbed fresh waters systems. The DP report applied statistical analysis to the historic and baseline surface and groundwater data to determine appropriate background chemistry.

Performance criteria are categorised as A, B or C, based on the different categories of receiving environments as listed below:

- Performance Criteria A – Hunter River (SW01, SW02 and SW03);
- Performance Criteria B – Hexham Swamp (SW04, SW05, SW06, SW07); and
- Performance Criteria C – (Groundwater).

The developed/referenced criteria and monitoring analytical schedule is shown in Table 2 and takes into account the sites historical utilisation and will be used to assess the quality of surface and groundwater results.

Table 2 - Performance Criteria and Analytical Schedule

Parameter	Units	Performance Criteria A	Performance Criteria B	Performance Criteria C	ANZECC 2000
Depth	mAHD	N/A	N/A	-	N/A
Conductivity	uS/cm	40000	6000	20500	20500
pH	pH Units	6.5 - 8.5	5.5 - 8.5	6.5 - 8.5	6.5 - 8.5
Aluminium (Al)	mg/L	2.5	2.5	0.055	0.055
Arsenic (As)	mg/L	0.013	0.013	0.013	0.013
Cadmium (Cd)	mg/L	0.0002	0.0002	0.0002	0.0002
Chromium (Cr)	mg/L	0.004	0.002	0.002	0.001
Copper (Cu)	mg/L	0.0045	0.0026	0.0071	0.0014
Iron (Fe)	mg/L	35	1.3	350	0.3
Lead (Pb)	mg/L	0.0044	0.0034	0.0034	0.0034
Mercury (Hg)	mg/L	0.0006	0.0006	0.0006	0.0006

¹Douglas Partners, 2014, *Report on discharge Criteria Assessment: Proposed Long Term Train Support Facility, Woodlands Close, Hexham*. Report for Aurizon Operations Limited.

Parameter	Units	Performance Criteria A	Performance Criteria B	Performance Criteria C	ANZECC 2000
Nickel (Ni)	mg/L	0.017	0.011	0.18	0.011
Zinc (Zn)	mg/L	0.054	0.019	0.65	0.008
Ammonia	mg/L	0.9	0.9	25	0.9
Turbidity	NTU	60	50	1200	50
Total Susp. Solids	mg/L	50	40	650	N/A
TKN	mg/L	8	4	12	N/A
Total Nitrogen	mg/L	10	4	12	0.5
Total Phosphorus	mg/L	2.75	1.9	14.5	0.05
Faecal Coliforms	cfu/100mL	1500	500	2000	150
BOD	mg/L	40	15	30	15
TRH C6-C36	mg/L	0.15	0.15	0.3	N/A
Naphthalene	mg/L	0.05	0.05	0.05	0.05
Phenanthrene	mg/L	0.0006	0.0006	0.0015	0.0006
Anthracene	mg/L	0.0006	0.0006	0.00095	0.00001
Fluoranthene	mg/L	0.001	0.001	0.0015	0.001
Benzo(a) pyrene	mg/L	0.0006	0.0001	0.0007	0.0001
Total PAHs	mg/L	0.01	0.0015	0.02	N/A
Benzene	mg/L	0.95	0.95	0.95	0.95
Ethyl Benzene	mg/L	0.08	0.08	0.08	0.08
Toluene	mg/L	0.18	0.18	0.18	0.18
Xylenes (total)	mg/L	0.625	0.625	0.625	0.625

Note: Groundwater metals will be dissolved and surface water total respectively.

2.4 Monitoring Methodology

The methodology required to be implemented when completing all surface and groundwater monitoring is detailed in Table 3 below.

Table 3 - Monitoring Methodology

Item	Surface Water	Groundwater
Relevant Technical Guidelines	<p><i>ASTM D6771-02, Standard practice for low-flow purging and sampling for wells and devices used for groundwater quality investigations, ASTM International.</i></p> <p><i>Australian Standard 5667:1998 Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS 5667.1:1998).</i></p> <p><i>Australian Standard 5667:1998 Water Quality – Sampling, Part 11: Guidance on the Sampling of Groundwater (AS 566.11:1998).</i></p>	
Field Sampling	<p>Surface water sampling is conducted using a reach pole with a dedicated sampling bottle attached. The bottle is lowered into the water body to allow a sample to be collected from below the surface.</p> <p>The sample is poured into the sample bottle and lid closed being careful to not overflow causing loss of preservatives. Air bubbles are to be minimised in the sample bottle.</p>	<p>Monitoring wells are gauged using an oil/water interface probe to measure standing water levels (SWL) and assess for the potential presence of LNAPL.</p> <p>Groundwater sampling is conducted using low flow techniques (peristaltic pump).</p> <p>The sample is poured into the sample bottle and lid closed being careful to not overflow causing loss of preservatives. Air bubbles are to be minimised in the sample bottle.</p>
Field Analysis	<p>Field measurements are taken using a calibrated water quality meter with measurements of temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO) and oxidation-reduction potential (REDOX) recorded.</p>	
Decontamination	<p>Prior to and following the collection of each sample, all non-disposable sampling equipment will undergo decontamination including:</p> <ul style="list-style-type: none"> • Washing of equipment with phosphate-free detergent (Decon Neutracon); and • Rinsing of equipment with fresh water. 	
Sample Handling and Transport	<p>Following collection, water samples are immediately placed on ice and stored in a cool, dark environment (esky) prior to being forwarded to the analytical laboratory within the specified holding times along with a COC form.</p>	

2.5 Quality Assurance

The methodology required to be implemented when completing all surface and groundwater monitoring is detailed in Table 4 below.

Table 4 - Quality Assurance

Item	Description	Requirement
Laboratory Analysis	All surface and groundwater samples are submitted to laboratories accredited by the National Association of Testing Authorities (NATA).	
Field Duplicates	Field duplicates are duplicate samples that are sent as independent samples to the same laboratory for analysis to assess the precision of the analytical results. Field duplicates should generally be collected from a well-mixed sample of soil, water or air. Water duplicates should be taken from the sample container simultaneously.	1 in 20 samples or 1 per day whichever is greater.
Field Splits	Field splits are duplicate samples that are sent to different laboratories for analysis to assess the precision of the results. Field splits should be collected using the same procedures as for field duplicates.	1 in 20 samples or 1 per day whichever is greater.
Equipment Blanks	Equipment blanks monitor possible contamination that may be introduced by inadequate equipment decontamination. After equipment has been decontaminated deionised water should be run through or over that section of the equipment that is used to collect the samples. The deionised water should be collected, sealed and labelled as a sample.	Equipment blanks can be placed on hold at the laboratory and only analysed should the primary data set indicate potential for cross contamination.
Trip Blanks	Trip blanks monitor possible contamination introduced during field and laboratory work. Before commencement of work each day that sampling is undertaken, in a clean location the trip blank sample container is filled with deionised water, sealed and labelled. It is then taken into the field for the duration of the work that day and is sent alongside all the other samples for analysis.	Trip blanks are usually placed on hold at the laboratory and only analysed should the primary data set indicate potential for cross contamination.

3.0 Compliance and Reporting

3.1 Reporting Requirements

Reporting requirements are detailed in Table 5 below.

Table 5 - Reporting Requirements

Type	Requirements	Approval Authority	Frequency
Quarterly Report	<ul style="list-style-type: none"> Completed monitoring and QA; Statistical comparison of monitoring results to site specific criteria and historical results; 	Aurizon	Quarterly
Annual Comprehensive Report	<ul style="list-style-type: none"> identification of exceedances; photograph of monitoring locations for comparison with previous years; and Graphing of monitoring results. 	DPE and Newcastle City Council	Annual (calendar year)

All results are recorded in the field either by hand or electronic tablet on forms developed by the engaged contractor with lab results recorded on certificates of analysis. All data is transferred to Aurizon maintained databases by the engaged contractor and interrogated to determine Site environmental performance as detailed in the quarterly and annual reports.

The quarterly report will be submitted to Aurizon to ensure non-compliances are identified and corrective actions implemented as required. The quarterly report is not required to be submitted to any regulatory authority.

As per condition C19(j) of the approval results of completed monitoring will be reported to the DP&E and EPA through completion and submission of an annual report.

3.2 Corrective Actions

As per Section 4 of the OEMP:

- Identified non-conformances with the SGMP, legislative or other requirement will be managed in accordance with *BSEMS-STD25 Operational Non Conformance & Incident Reporting*; and
- corrective and preventative actions arising from non-conformances will be managed in accordance with *BSEMS-STD05 Effectiveness of Corrective & Preventative Actions*.

Non-conformances will be identified by the completion of routine inspections of the site undertaken as per Section 4 of the OEMP. Exceedances of prescribed monitoring criteria will be identified during review of monitoring data undertaken as part of scheduled reporting as per Section 3 – Reporting of this plan and annual auditing detailed in Section 4.2 of the OEMP.

In the event that chronic exceedances of the listed performance criteria are recorded an investigation into the cause, potential impacts and feasible mitigation options will be triggered. The investigation will be undertaken by Aurizon and in consultation with suitably qualified contaminated land consultant if required in accordance with Section 4 of the OEMP.

Due to the Site experiencing high groundwater levels and being relatively flat, capping of the site and construction of permanent drainage swales and detention ponds may have the potential to impact groundwater levels and surface water flow regimes. To ensure impacts to surface and groundwater levels/flow are addressed a Stormwater Management Plan has been adapted from the Hexham Train Support Facility: Stormwater Management Plan (Worley Parsons, 2013).

APPENDICIES

APPENDIX A Minister Conditions of Approval MP07_0171 and Statement of Commitments

Relevant Minister Conditions of Approval

MCoA	Description	Section/Management Plan
C19 (a)-(j)	A Surface Water and Groundwater Monitoring Program shall be prepared and implemented to monitor impacts on surface water and groundwater quality and hydrology. The program shall be developed in consultation with the EPA, NoW and Hunter-Central Rivers CMA and shall include but not necessarily be limited to: (a)-(j)	This Plan
F2	(h) procedures for periodic monitoring of groundwater depth and flow and groundwater quality in the vicinity of the SSI and groundwater seepage, including the location and frequency of monitoring;	Section 3.2 SGMP
F2	(i) a contingency plan to address changes in groundwater depths and flows and/or groundwater quality and groundwater seepage into the drainage swales;	Section 3.2 SGMP

Statement of Commitments

SoC	Commitment	OEMP Section/Management Plan
Item 3	A. Water Quality Management Plan;	This Plan
Item 16	<p>Surface water and groundwater monitoring will be regularly undertaken during the ongoing operation of the TSF to:</p> <p>A. Identify any change in water quality; and</p> <p>B. Determine the appropriate treatment strategies to be implemented to maintain or improve water quality.</p> <p>The water monitoring program for the TSF will include monitoring of changes in hydrological regime associate with discharges to catchment 2 (which contains the Swamp Oak Forest EEC) in the northwest and to Catchment 5 (which contains the Coastal Saltmarsh EEC) to the south. Further opportunities will be investigated to manage stormwater flows on the site to assist in creating favourable water flows and levels that support rehabilitated and offset areas of significant ecological value.</p>	This Plan

