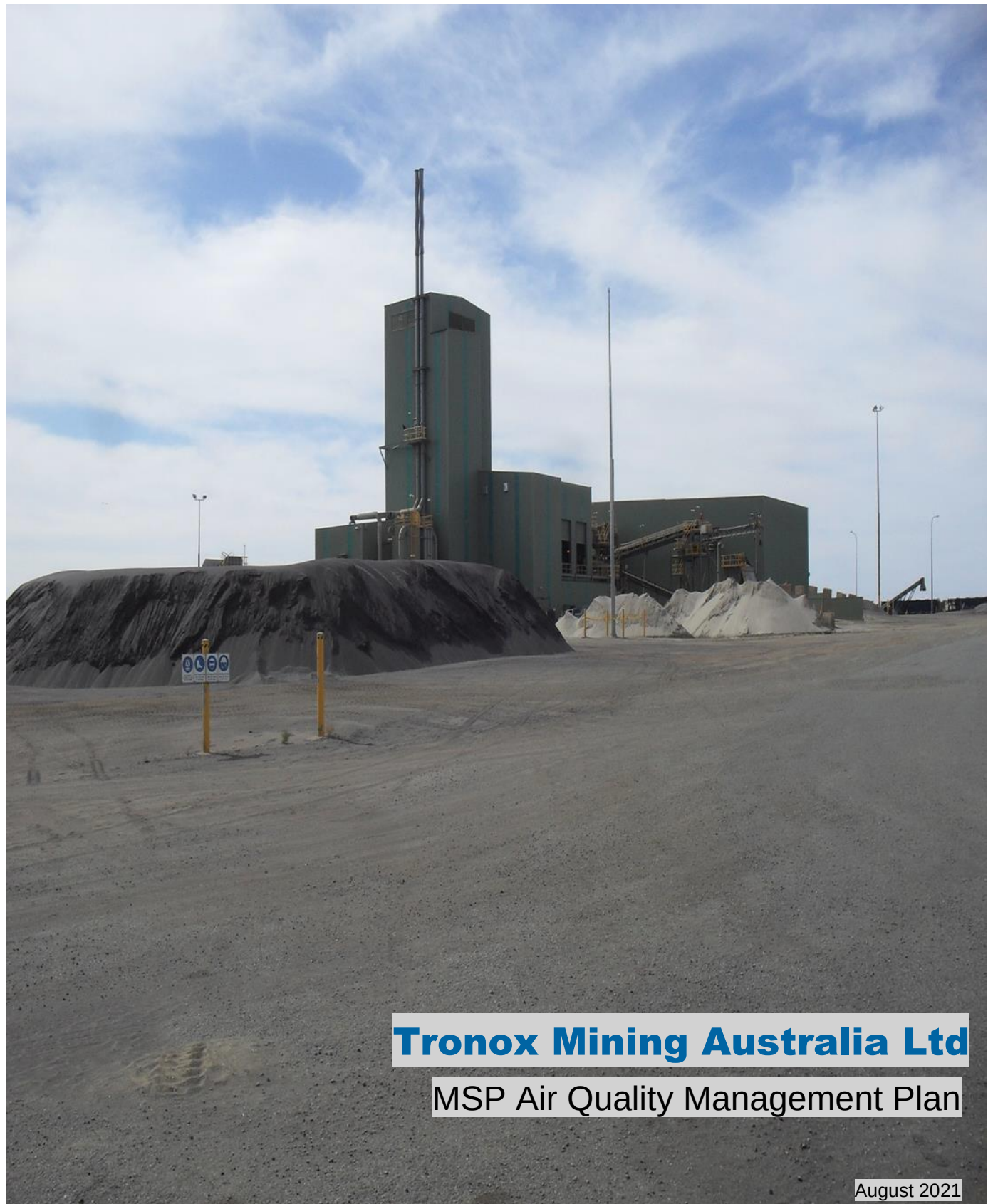




Tronox Mining Australia Ltd

MSP Air Quality Management Plan

August 2021

Revision History

Rev No.	Document No.	Description	Approval Details	Date
A	603314	Draft for Tronox approval		
B	603314	Draft for submission to the Department of Planning and Infrastructure		January 2013
0	603314	Approved final	Approved by the Director-General	September 2013
1	603314	Table 2 updated	GHD & Tronox	October 2014
2	603314	Revised for amended conditions	GHD & Tronox	October 2016
3	603314	Final Issue	GHD & Tronox	November 2016
4	603314	Revised for amended licence conditions – removal of PM10 monitoring	GHD and Tronox	March 2018
5	603314	Revised for changes to monitoring frequencies due to COVID 19.	B.Isaacs	August 2020
6	603314	Revised plan for Development Consent MOD6 (May 2021) and NSW EPA Licence 12314 Variation (12 August 2021)	B Isaacs	August 2021

Abbreviations and Glossary

Abbreviation	Full Title
AEMR	Annual Environmental Management Report
Annual Return	Annual Return as required by the Environment Protection Licence (EPL)
AQMP	Air Quality Management Plan
AS	Australian Standard
BCA	Building Code of Australia
BHCC	Broken Hill City Council
CEMP	Construction Environmental Management Plan
CL&W	Crown Lands and Water within Department of Industry
DA	Development Application
dB (A)	Decibel (A-weighted scale)
Department	NSW Department of Planning and Environment
Deposited Dust	Any particulate matter which falls out from suspension in the atmosphere
DPIE	NSW Department of Planning, Industry and Environment
EA	Environmental Assessment
EES	Environment, Energy and Science (Formally OEH)
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Tronox Murray Basin Environmental Management Strategy
EP & A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence
GHD	GHD Pty Ltd
ISO	International Standards Organisation
LEMP	Landfill Environmental Management Plan
ML	Mega litre
MSP	Mineral Separation Plant (Broken Hill)
NO ₂	Nitrogen dioxide
NO _x	Nitrous Oxides
NSW	New South Wales
OEMP	Operational Environment Management Plan
Operation	Any activity that results in the production, or intended production, of commercial quantities of mineral sands, including ilmenite, rutile or zircon
PM ₁₀	Particulate matter less than 10 µm
POEO Act 1997	<i>Protection of the Environment Operations Act 1997</i>
Premises	Broken Hill Mineral Separation Plant site
Project	Broken Hill Mineral Separation Plant
Secretary	Secretary of the Department of Planning, industry and Environment (or nominee)
SEE	Statement of Environmental Effects
TfNSW	Transport for New South Wales NSW Road and Maritime Services
Tronox	Tronox Murray Basin / Tronox Mining Australia Pty Ltd
TSP	Total suspended particulates, dust particles with a diameter no greater than 50 micrometresmicrometers (µm) which tend to remain suspended in the atmosphere

Table of contents

Limitations	iii
1. Introduction.....	1
1.1 Purpose of the management plan.....	1
1.2 Scope of the management plan	1
1.3 Document succession	1
2. Project description.....	2
2.1 Air quality values	2
2.2 Summary of relevant activities associated with air quality.....	2
2.3 Summary of potential environmental impacts	3
3. Environmental management framework	4
3.1 Relationship to other Environmental Management Plans (EMPs).....	5
3.2 Legislative requirements and project environmental approvals.....	7
3.3 Roles and responsibilities	17
3.4 Training and inductions.....	18
3.5 Complaint, non-conformance and incident management	18
3.6 Environmental reporting and correspondence	18
3.7 Audits of the AQMP	19
3.8 Review and update of the AQMP	19
4. Environmental management program.....	20
4.1 Objective	20
4.2 Performance standard	20
4.3 Environmental mitigation measures.....	21
4.4 Monitoring	22
4.5 Contingency measures	29
5. References	30

Table index

Table 1	Overview of activities producing fugitive dust emissions	3
Table 2	Approval documents for the MSP	7
Table 3	Regulatory consent conditions applicable to this AQMP	8
Table 4	Responsibility for air quality management at MSP	17
Table 5	Criteria for air quality parameters.....	21
Table 6	Criteria for dust	21
Table 7	Monitoring summary for air quality management.....	22

Figure index

Figure 1	Tronox's environmental management framework	4
Figure 2	Environmental management documents for Tronox's operations in the Murray Basin in NSW	6
Figure 3	Receiver and dust monitoring locations	24
Figure 4	Stack locations and general arrangement	25

Appendices

Appendix A Variation of Environmental Protection Licence No 12314 (12 August 2021)	
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1. Introduction

1.1 Purpose of the management plan

Tronox Mining Pty Ltd (Tronox) operates a number of mineral sands mines and a mineral separation plant in the Murray Basin. Tronox's sites in the Murray Basin have collectively been referred to as the 'Murray Basin sites' for the purpose of this document. This Air Quality Management Plan (AQMP) has been created for the management of air quality at the Mineral Separation Plant (MSP) in Broken Hill.

1.2 Scope of the management plan

The AQMP provides an overview of the environmental management and performance requirements related to air quality at the MSP. This AQMP includes:

- the requirements for environmental management of air quality for operations at the MSP as stipulated by regulatory approvals for the project
- the responsibilities for implementing this AQMP
- a description of the environmental controls and associated limits to meet objectives, targets and regulatory approval requirements
- an overview of the environmental monitoring programs and contingency measures associated with environmental mitigation measures

Further details on the Environmental Management Framework for Tronox's operations at this site are provided in section 3.

1.3 Document succession

Tronox has previously developed the plans following to manage air quality:

- MSP Air Quality Management Plan, April 2004
- MSP Air Quality Management Plan, November 2016

This AQMP supersedes the documents listed above, which are now obsolete.

This AQMP has been prepared based on information contained within the original management plan and advice received from Tronox regarding current activities and management measures.

This revision of the AQMP (July 2021) has been created to address the requirements of the Modification to the Conditions of Consent (DA 345-11-01) dated May 2021 and variation to the Environmental Protection Licence (12314) dated 12 August 2021.

Tronox is required to submit management plans to the Department of Planning Industry and Environment for approval.

2. Project description

The Environmental Management Strategy (EMS, refer to section 3.1) provides details on environmental management of the current operations at the MSP within the Murray Basin in NSW. Air quality is an environmental aspect that requires management to minimise impacts associated with activities for the project.

2.1 Air quality values

An Environmental Impact Statement (EIS) was completed for the MSP in 2001 (Bemax 2011).

The EIS documents were prepared in accordance with the requirements of the NSW *Environmental Planning and Assessment Act 1979* (EP & A Act), to accompany the Development Application (DA) submitted by Bemax (now Tronox) for the Project.

The EIS defines the air quality values as amenity and the protection of human health, by referencing the components of the relevant air quality legislation.

2.2 Summary of relevant activities associated with air quality

The major sources of emission to air associated with the MSP are the stacks associated with the dryers, heaters and kilns. These include:

- Ilmenite dryer stack
- Leucoxene dryer stack
- Leucoxene bag house stack
- Ilmenite bag house stack
- Ilmenite reheater stacks x 2

Emissions to air from the combustion of LPG or LNG will be largely restricted to dust deposition, total suspended solids (TSP) and PM₁₀ with low NO_x emissions.

The stacks, baghouses and associated alarms have been designed in accordance with the development consent conditions 3.2 and 3.4 and approved by the EPA. They should not be modified without first seeking a revision to the development consent agreement and renewed approval from the EPA and complying with licence condition E1.

There are a number of activities routinely occurring on the site that have the potential to generate dust and particulates. An overview of these activities and the mechanisms by which they can affect upon air quality are shown in Table 1.

Table 1 Overview of activities producing fugitive dust emissions

Activity	Description of emissions generation
Truck movements	Wheel generated dust
Conveyor belt operation	Wind generated dust Dust made airborne during loading of conveyor Dust made airborne by dumping off the end of the conveyor
Preparing trench for waste disposal	Handling of topsoil by the excavator Wheel generated dust Wind erosion from stockpiled excavated material
Stockpiling of materials	Wind generated dust

2.3 Summary of potential environmental impacts

Significant impacts potentially associated with operations were assessed in the EIS for the MSP development. Mitigation measures that regulatory authorities (for example, the DPIE, EPA, TfNSW and local councils) deemed required to reduce potential risks to an acceptable level were identified and included in the Conditions of Approval and the EPL (Table 2 and Table 3).

A preliminary, high-level risk assessment for the MSP was created as part of the update of the EMS. This high-level assessment was a subjective assessment based on Tronox's knowledge of site operations to-date and Tronox's advice on the effectiveness of existing controls in reducing risks. Further details on this risk assessment are provided in the EMS.

A summary of the main potential environmental impacts for air quality at the MSP are summarised below.

- Damage to human health from airborne particulate matter or pollutants
- Damage to plant or animal health from airborne particulate matter or pollutants
- Generation of excessive dust from operations and transport on sensitive receptors
- Amenity impacts on surrounding community (for example, excessive odour)

The mitigation measures outlined in this document are based on the requirements of regulatory consent conditions (Table 2 and Table 3). The preliminary risk assessment (as appended to the EMS) identified the residual risk associated with air quality following the implementation of the mitigation measures in this plan as low. Mitigation measures for the management of air quality are provided in section 4 of this document.

3. Environmental management framework

The environmental management framework for Tronox's operations in the Murray Basin is based on the requirements of AS/ISO 14001¹ (the standard). Major elements of the environmental management framework include:

- Project risk identification and assessment
- Environmental objectives and measurable performance targets
- Legal and other requirements
- Roles and responsibilities for environmental management
- Staff training and induction processes
- Responding to and managing complaints, non-compliances and incidents
- Environmental reports and correspondence for the project
- Audits of the EMPs
- Review and update of the EMPs

This AQMP has been designed to as a subordinate document to the Environmental Management Strategy (EMS), which provides the framework for all Tronox's operations in the Murray Basin. Each of the main components of standard has been addressed in detail within the EMS. Information provided within this AQMP provides additional, specific details for air quality management. The environmental management framework in place for Tronox's current operations in the Murray Basin in illustrated in Figure 1

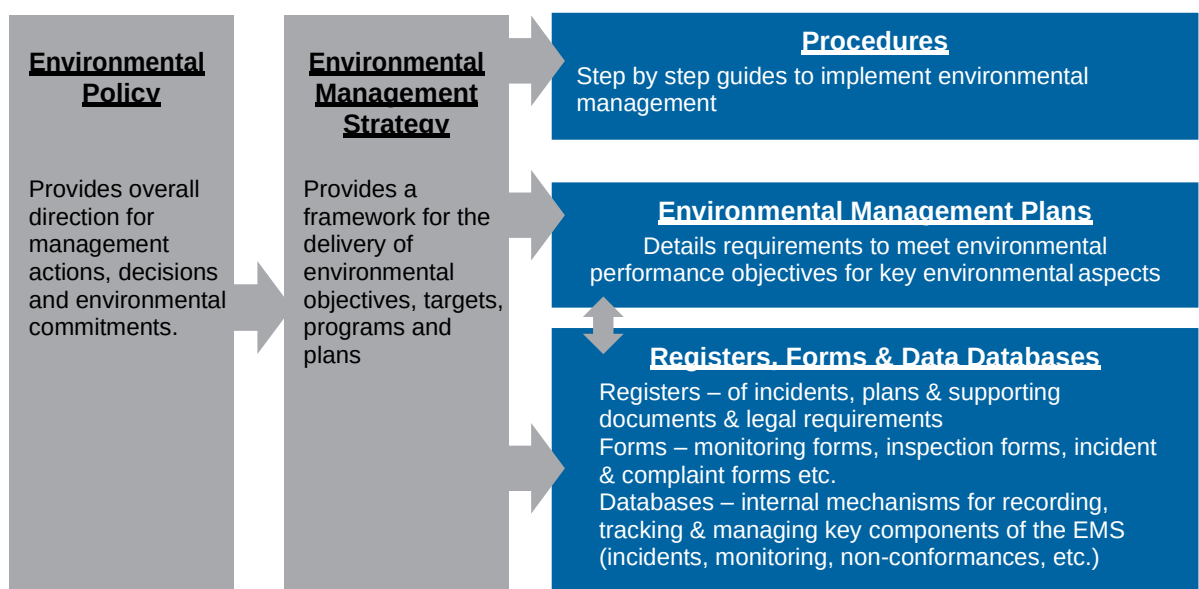


Figure 1 Tronox's environmental management framework

3.1 Relationship to other Environmental Management Plans (EMPs)

The structure of the environmental management documentation is presented in Figure 2.

This AQMP makes direct reference to the following environmental management documentation listed in Figure 2:

- The Environmental Management System (EMS)
- The MSP Operational Environmental Management Plan

Companywide Integrated Management System (Environment and Safety)

Murray Basin Operations Environmental Management Strategy

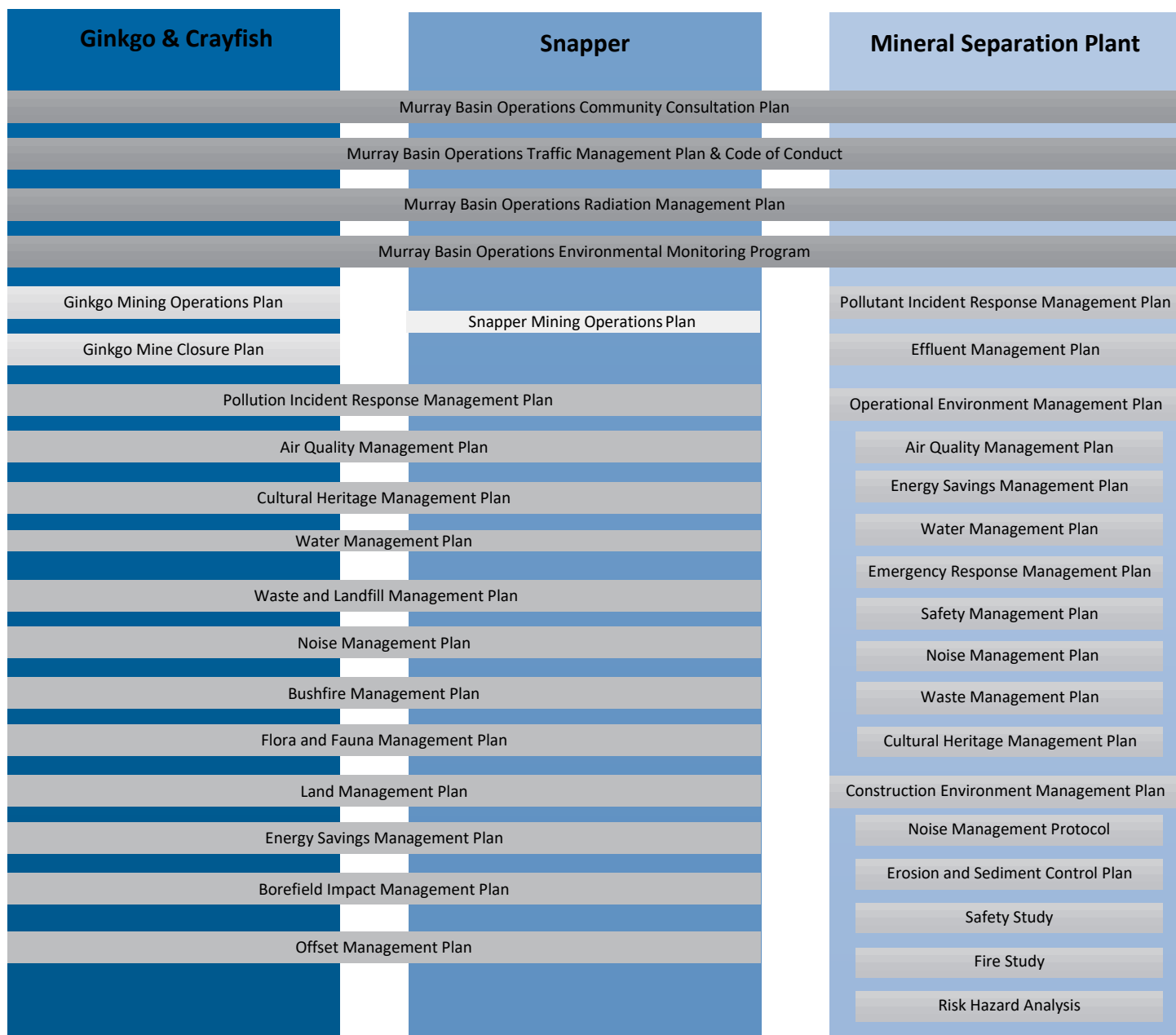


Figure 2: Environmental Management Documentation for Tronox Operations in the Murray Basin in NSW

3.2 Legislative requirements and project environmental approvals

3.2.1 Project regulatory approvals

Tronox is required to create, maintain and implement EMPs in accordance with the approval conditions for the MSP. There are a number of regulatory approval documents that contain conditions for environmental management that Tronox must adhere to for operations at this site. This AQMP has been created to address the specific requirements of the regulatory approval documents. The current regulatory approval documents are provided in Table 2 below. The requirements of these regulatory approvals to be addressed in this AQMP are provided in Table 3.

Table 2 Approval documents for the MSP

Approval Document	Document Number	Current revision date
Mineral Separation Plant Conditions of Approval	DA 345-11-01	24 May 2021
Mineral Separation Plant Environmental Protection Licence	EPL 12314	12 August 2021

Table 3 Regulatory consent conditions applicable to this AQMP

Condition number	Condition details	Section in AQMP																																				
Mineral Separation Plant Conditions of Approval (DA 345-11-01)																																						
Schedule 2, Condition 3.2 Plant and Equipment – Design Parameters	(a) The design parameters for the discharge points specified in the table below must meet the requirements specified in the table.	Section 2.2																																				
	<table><tr><th>EPA Identification No.</th><th>Minimum Stack Height</th><th>Minimum Discharge Velocity (m/s)</th><th>Minimum Stack Diameter (m)</th></tr><tr><td>6</td><td>40.0</td><td>15</td><td>0.49</td></tr><tr><td>7</td><td>40.2</td><td>15</td><td>0.75</td></tr><tr><td>8</td><td>40.2</td><td>15</td><td>1.00</td></tr><tr><td>9</td><td>40.2</td><td>15</td><td>0.35</td></tr><tr><td>10</td><td>40.2</td><td>15</td><td>0.50</td></tr><tr><td>11</td><td>40.2</td><td>15</td><td>0.55</td></tr><tr><td>12</td><td>40.2</td><td>15</td><td>0.60</td></tr><tr><td>13</td><td>41.2</td><td>15</td><td>0.55</td></tr></table>		EPA Identification No.	Minimum Stack Height	Minimum Discharge Velocity (m/s)	Minimum Stack Diameter (m)	6	40.0	15	0.49	7	40.2	15	0.75	8	40.2	15	1.00	9	40.2	15	0.35	10	40.2	15	0.50	11	40.2	15	0.55	12	40.2	15	0.60	13	41.2	15	0.55
	EPA Identification No.		Minimum Stack Height	Minimum Discharge Velocity (m/s)	Minimum Stack Diameter (m)																																	
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	10		40.2	15	0.50																																	
	11		40.2	15	0.55																																	
	12		40.2	15	0.60																																	
13	41.2	15	0.55																																			
(b) All stacks shall be designed in accordance with good engineering practice in order to minimise the effects of stack tip downwash and building wake effects on ground –level air pollutant concentrations.																																						
Note: Where necessary, the Applicant can apply to modify the stack design parameters included in Condition 3.2(a). The application must demonstrate that the modified design parameters comply with the Protection of the Environment Operations (Clean Air) Regulation 2010.																																						
The following documents should be referred to for determining good engineering practice stack height:																																						
- USEPA, 1985, Guideline for Determination of Good Engineering Practice Stack Height (Technical support Document for the Stack Height Regulations), Revised EPA-450/4-80-023R. United States Environment Protection Agency, Washington DC, USA. - USEPA, 1995, User’s Guide to the Building Profile Input Program, Revised February 1995, EPA-454/R-93-038. United States Environment Protection Agency, Washington DC, USA.																																						

Condition number	Condition details	Section in AQMP
	USEPA, 1997, Addendum to ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model. United States Environment Protection Agency, Washington DC, USA. c) Prior to constructing stacks 8, 9, 10 and 12 the Applicant must have applied for, and been granted, a licence variation by the EPA to permit the use of these stacks	
Schedule 2, Condition 3.4 Alarms & Measures	(a) The Applicant must prepare and submit to the EPA for review, prior to the operation of the relevant baghouse or scrubber: (i) details of devices, measures or alarms to be used to warn operators that a malfunction has occurred in bag house point numbers, 6, 7, 8, 9, 10, 11 & 12; and (ii) details of devices, measures or alarms to be used to warn operators that the point number 13 scrubber has malfunctioned. (b) Prior to the commencement of the development the Applicant must have confirmation in writing from the EPA that the details submitted in compliance with Subclause (a) is acceptable to the EPA. (c) The Applicant must install devices, measures or alarms that are acceptable to the EPA that will warn operators that a malfunction has occurred in pollution controls connected to discharge points 6, 7, 8, 9, 10, 11, 12 and 13	Section 2.2
Schedule 2, Condition 3.5 Dust Suppression	(a) Activities occurring in or on the Premises must be carried out in a manner that will minimise the generation, or emissions from the premises, of wind-blown or traffic generated dust. (b) The Premises must be maintained in a condition, which minimises or prevents the emission of dust from the Premises.	Section 4.3
Schedule 2 Condition 4.4 Air Quality Monitoring	(a) Monitoring sites shall be selected to monitor dust deposition rates and total suspended particulate (TSP) matter at nearby sensitive receptors, in accordance with Australian Standard AS 2922-1987 Ambient Air – Guide for Siting of Sampling Units. (b) Dust deposition monitoring and analysis shall be conducted according to Australian Standard AS 3580.10.1-1991 Particulates – Deposited Matter – Gravimetric Method. (c) Suspended particulate – PM10 monitoring and analysis shall be conducted according to Australian Standard AS/NZS 3580.9.6:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM10 high volume sampler with size selective inlet – Gravimetric method. The results of this monitoring shall be reported in the Annual Review.	Section 4.4

Condition number	Condition details	Section in AQMP								
		Section 4.4								
Schedule 2, 6.4 Operation Environmental Management Plan (OEMP)	(c) As part of the OEMP for MSP, required under Condition 6.4(a) of this Consent, the Applicant shall prepare and implement the following Management Plans: (i) an Air Quality Management Plan to outline measures to minimise impacts from the MSP on local and regional air quality. The Plan shall address the requirements of the EPA and BHCC, should there be any. The Plan shall include, but not necessarily be limited to: - identification of all major sources of particulate and gaseous air pollutants that may be emitted from the MSP, being both point-source and diffuse emissions, including identification of the major components and quantities of these emissions; - monitoring for gaseous and particulate emissions from the MSP, in accordance with any requirements of the EPA; including monitoring of stack emissions (should they be constructed) as required by the EPL. - procedures for the minimisation of gaseous and particulate emissions from the MSP, and the reduction of these emissions over time, where appropriate; - protocols for regular maintenance of process equipment to minimise the potential for leaks and fugitive emissions; - a contingency plan should an incident, process upset or other initiating factor lead to elevated air quality impacts, whether above normal operating conditions or environmental performance goals/limits - Triggers for review of monitoring data and if required re-instating monitoring ofPM₁₀ at point 5.	Through - out document Section 2.2 Section 4.4 Section 4.3 Section 4.5								
Environment Protection Licence (12314)										
2 - Discharges to Air and Water and Applications to Land, P1 - Location of monitoring/discharge points and areas	P1.1 - The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point <table><tr><th>EPA identification no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr><tr><td>1</td><td>Dust monitoring</td><td></td><td>Dust deposit gauge marked as DBH3 in Figure 6-3 of the Broken Hill Mineral Separation Plant Modification Report,</td></tr></table>	EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description	1	Dust monitoring		Dust deposit gauge marked as DBH3 in Figure 6-3 of the Broken Hill Mineral Separation Plant Modification Report,	Section 4.4
EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description							
1	Dust monitoring		Dust deposit gauge marked as DBH3 in Figure 6-3 of the Broken Hill Mineral Separation Plant Modification Report,							

Condition number	Condition details			Section in AQMP
			received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	
	2	Dust monitoring	Dust deposit gauge marked as DBH1 in Figure 6-3 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	
	4	Dust monitoring	Dust deposit gauge marked as DBH4 in Figure 6-3 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	
	6	Discharge to Air & Monitoring	Discharge to Air & Monitoring Bag house stack serving leucoxene circuit identified as "Leucoxene Hygiene Bag House Stack" in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	
	7	Discharge to Air & Monitoring	Discharge to Air & Monitoring Bag house stack serving ilmenite circuit identified as 'Ilmenite Hygiene Bag House Stack' in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	
	10	Discharge to Air & Monitoring	Discharge to Air & Monitoring Bag house stack serving LPG/LNG fired leucoxene dryer identified as 'Leucoxene Dryer Stack' in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.	

Condition number	Condition details			Section in AQMP
	11	Discharge to Air & Monitoring	Discharge to Air & Monitoring	Bag house stack serving LPG/LNG fired Ilmenite dryer identified as "Ilmenite Dryer Stack" in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.
	12	Discharge and Monitoring	Discharge and Monitoring	Reheater stack identified as "Ilmenite Reheater Stack 1" in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.
	13	Discharge and Monitoring	Discharge and Monitoring	Reheater stack identified as "Ilmenite Reheater Stack 2" in Figure 3-2 of the Broken Hill Mineral Separation Plant Modification Report, received by the EPA on 11 June 2021 and located on EPA file at DOC21/624698.

3 Limit Conditions - L2 Concentration Limits	L2 .1 - For each monitoring/discharge point or utilisation area specified in the table\ below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.						
	L2.2 - Air Concentration Limits						
	Point 6, 7, 10, 11						
	Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period	
	Total Solid Particles	Milligrams per cubic metre	50				
	Point 7, 11						
	Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period	
	Nitrogen oxides	milligrams per cubic metre	350				
	L2.3 Reference Conditions: The reference conditions for limit concentrations in the above tables are:						
	Dry, 273 K, 101.3 KPa, 3% O²						

Condition number	Condition details	Section in AQMP																																																
concentration of pollutants discharged	M2.1 - For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns: M2.2 - Air Monitoring Requirements Point 1, 2, 4 <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Methods</th></tr><tr><td>Particulates – Deposited Matter</td><td>Grams per square metre per month</td><td>Monthly</td><td>Australian Standard 3580.10.1-2003</td></tr></table> Point 6, 7 <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Methods</th></tr><tr><td>Dry gas density</td><td>Kilograms per cubic metre</td><td>Yearly</td><td>TM-23</td></tr><tr><td>Moisture content</td><td>Percent</td><td>Yearly</td><td>TM-22</td></tr><tr><td>Temperature</td><td>Degrees Celsius</td><td>Yearly</td><td>TM-2</td></tr><tr><td>Total Solid Particles</td><td>Milligrams per cubic metre</td><td>Yearly</td><td>TM-15</td></tr><tr><td>Velocity</td><td>Metres per second</td><td>Yearly</td><td>TM-2</td></tr><tr><td>Volumetric flowrate</td><td>Cubic metres per second</td><td>Yearly</td><td>TM-2</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Pollutant	Units of measure	Frequency	Sampling Methods	Particulates – Deposited Matter	Grams per square metre per month	Monthly	Australian Standard 3580.10.1-2003	Pollutant	Units of measure	Frequency	Sampling Methods	Dry gas density	Kilograms per cubic metre	Yearly	TM-23	Moisture content	Percent	Yearly	TM-22	Temperature	Degrees Celsius	Yearly	TM-2	Total Solid Particles	Milligrams per cubic metre	Yearly	TM-15	Velocity	Metres per second	Yearly	TM-2	Volumetric flowrate	Cubic metres per second	Yearly	TM-2													
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Condition number	Condition details																																																									
	Point 10,11,12,13 <table><thead><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Methods</th></tr></thead><tbody><tr><td>Carbon dioxide</td><td>percent</td><td>Yearly</td><td>TM-24</td></tr><tr><td>Dry gas density</td><td>kilograms per cubic metre</td><td>Yearly</td><td>TM-23</td></tr><tr><td>Moisture content</td><td>percent</td><td>Yearly</td><td>TM-22</td></tr><tr><td>Molecular weight of stack gases</td><td>grams per gram mole</td><td>Yearly</td><td>TM-23</td></tr><tr><td>Nitrogen Oxides</td><td>milligrams per cubic metre</td><td>Yearly</td><td>TM-15</td></tr><tr><td>Oxygen (O2)</td><td>percent</td><td>Yearly</td><td>TM-25</td></tr><tr><td>Temperature</td><td>degrees Celsius</td><td>Yearly</td><td>TM-2</td></tr><tr><td>Total Solid Particles</td><td>milligrams per cubic metre</td><td>Yearly</td><td>TM-15</td></tr><tr><td>Velocity</td><td>metres per second</td><td>Yearly</td><td>TM-2</td></tr><tr><td>Volumetric flowrate</td><td>cubic metres per second</td><td>Yearly</td><td>TM-2</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></tbody></table>	Pollutant	Units of measure	Frequency	Sampling Methods	Carbon dioxide	percent	Yearly	TM-24	Dry gas density	kilograms per cubic metre	Yearly	TM-23	Moisture content	percent	Yearly	TM-22	Molecular weight of stack gases	grams per gram mole	Yearly	TM-23	Nitrogen Oxides	milligrams per cubic metre	Yearly	TM-15	Oxygen (O2)	percent	Yearly	TM-25	Temperature	degrees Celsius	Yearly	TM-2	Total Solid Particles	milligrams per cubic metre	Yearly	TM-15	Velocity	metres per second	Yearly	TM-2	Volumetric flowrate	cubic metres per second	Yearly	TM-2													
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Dry gas density	kilograms per cubic metre	Yearly	TM-23																																																							
Moisture content	percent	Yearly	TM-22																																																							
Molecular weight of stack gases	grams per gram mole	Yearly	TM-23																																																							
Nitrogen Oxides	milligrams per cubic metre	Yearly	TM-15																																																							
Oxygen (O2)	percent	Yearly	TM-25																																																							
Temperature	degrees Celsius	Yearly	TM-2																																																							
Total Solid Particles	milligrams per cubic metre	Yearly	TM-15																																																							
Velocity	metres per second	Yearly	TM-2																																																							
Volumetric flowrate	cubic metres per second	Yearly	TM-2																																																							
5 - Monitoring and Recording - M3 - Testing methods - concentration limits	M3.1 - Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or	Section 4.4																																																								

Condition number	Condition details	Section in AQMP
	c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place. M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted. Note - The <i>Protection of the Environment Operations (Clean Air) Regulation 2010</i> requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".	
8 - Special Conditions; E1 - Alarms & Measures	E1.1 - The licensee must install devices, measures or alarms that are acceptable to the EPA that will warn operators that a malfunction has occurred in baghouses connected to discharge points 6,7,10,11, 12 and 13.	Section 4.3
8 - Special Conditions; E2 – Further Information Required for Coal Firing	E2.1 Prior to installing any coal fired equipment the proponent must have applied for and been granted a licence variation by the EPA to permit the use of the fuel. E2.2 An application for licence variation to install and discharge coal fired fuel must include a review of the July 2005 air quality report for the Mineral Separation Plant prepared by Pacific Air and Environment. The review must include the following; a) demonstration of compliance with relevant air quality limits for solid particulates, Type 1 & Type 2 substances, nitrogen dioxide, sulphur dioxide and sulphuric acid mist in the Protection of the Environment Operations (Clean Air) Regulation 2002; b) identification of the sulphur content of the proposed coal; c) an assessment of the impact of nitrogen dioxide, sulphur dioxide and particulates at the nearest sensitive receptors; d) a detailed discussion of the methodology used to calculate expected emission rates of nitrogen oxides, sulphur dioxide and sulphuric acid mist from the stacks, and e) identification of changes required to air quality controls.	Section 2.2

3.2.2 Relevant legislation and other requirements

This project is subject to the requirements of the New South Wales *Protection of the Environment Operations Act 1997* and its subordinate legislation. A full legislative register is provided in the EMS (2012); acts, regulations and policies specific to this AQMP are listed below.

Federal (Commonwealth) Acts

- *Environment Protection and Biodiversity Conservation Act 1999*
- *National Environmental Protection Measures (Implementation) Act 1998*

State (NSW) Acts

- *Environmental Planning and Assessment Act 1979*
- *Mining Act 1992*
- *Protection of the Environment Operations Act 1997*
- *Protection of the Environment Operations (Clean Air) Regulation 2010 Work Health and Safety Act 2011*

Relevant Standards and Policies

- Variation to the National Environment Protection (Ambient Air Quality) Measure 2015
- National Environment Protection (National Pollutant Inventory) Measure 1998 (Commonwealth)

3.3 Roles and responsibilities

Overall roles and responsibilities for environmental management at the MSP, Snapper and Ginkgo Mines are outlined in section 4.2 of Tronox's EMS. Table 4 outlines requirements specific to air quality management at MSP.

Table 4 Responsibility for air quality management at MSP

Management Measure	Responsibility
Monitoring	
Overseeing implementation of the air quality monitoring program outlined in Section 4.4	Senior SHE Advisor MSP
Implementation of the air quality monitoring program outlined in Section 4.4	Senior SHE Advisor MSP
Calibration of monitoring equipment	Senior SHE Advisor MSP
Environmental Reporting	
Assessment air quality against acceptable levels as defined by the air quality standards (Section 3.2)	Environmental Technician
Environmental reporting and maintaining environmental data related to air quality.	Environmental Technician
Review of the air quality management measures	Senior SHE Advisor MSP

Management Measure	Responsibility
Receiving and responding to complaints in accordance with section 6.1 (a) of the development consent conditions.	MSP Manager
Training and Competency	
Assignment of responsibilities to competent staff	MSP manager and training manager
Performing all duties to an appropriate standard	All personnel
Operational activities	
Ripping and revegetation of obsolete access tracks	Environmental Lead or delegate under the direction of the MSP Manager
Use of irrigation and/or chemical dust suppressants on stockpiles to minimise dust emissions	Coordinated by MSP manager
Operation of process equipment in an appropriate and efficient manner	All personnel, under the direction of shift supervisors and the MSP manager
Maintenance	
Maintenance of baghouses and ilmenite kiln wet scrubber to minimise air emissions	MSP manager
Installation and maintenance of devices fitted to the stacks which warn operators of malfunctions in the emission controls	MSP manager
Maintenance of process equipment in accordance with manufacturers specifications	MSP manager

3.4 Training and inductions

Overall training and induction requirements for Tronox's operations in the Murray Basin are outlined in Tronox's EMS.

3.5 Complaint, non-conformance and incident management

Complaint, non-conformance and incident management for Tronox's operations at in the Murray Basin is described in Tronox's EMS.

3.6 Environmental reporting and correspondence

3.6.1 Annual Reporting

Conditions of Approval (refer to Table 1) 7.1 of Schedule 2 for the MSP, 5 of Schedule 4 for the Snapper Mine and 9.2.1 of Schedule 2 for the Ginkgo Mine, require that Tronox submit an Annual Environmental Management Report to the Secretary of the Department of Planning, Industry and Environment. Details of information to be included in the Annual Environmental Management Report (AEMR) are provided in Tronox's EMS. For air quality, the AEMR should include but not be limited to:

- The results of the environmental monitoring

- Comparison of air quality monitoring results with Tronox's nominated targets
- Discussion and interpretation of air quality monitoring results
- If the contingency plan is activated, the outcomes of the plan, as described in section 4.5
- A summary of any mitigation measures implemented to reduce gaseous and particulate emissions
- Air quality targets and strategies for the next year where applicable, taking into account any trends in air quality monitoring results

The Environmental Protection Licence (EPL, Table 1) for the MSP stipulates the inclusion of a monitoring and complaints summary in Tronox's Annual Return that is completed for each site and supplied to the EPA no later than 60 days after the end of each reporting period (refer to the EMS for further details). Air quality is required to be reported to the EPA as part of the Annual Return. Air quality information included in the Annual Return should include:

- A statement of compliance
- A monitoring and complaints summary including
 - An analysis and interpretation of monitoring results
 - Actions to correct identified adverse trends

3.7 Audits of the AQMP

Conditions of Approval (refer to Table 1) 4.1 of Schedule 2 (MSP) and 8.1 of Schedule 2, (Ginkgo) and Condition 5 of Schedule 4 (Snapper), require that Tronox conduct an Independent Environmental Audit every three years or as otherwise directed by the Director-General of the Department of Planning. Matters to be covered by the Independent Environmental Audit are described in Tronox's EMS.

Further detail of the how audits of the EMPs will be conducted (including internal audits) is provided in the EMS.

3.8 Review and update of the AQMP

The Conditions of Approval 6.8 of Schedule 2 (MSP) and 5 of Schedule 5 (Ginkgo) and 8 of Schedule 4 (Snapper) outline requirements for revision and update of EMPs.

EMPs are reviewed, and if necessary revised to the satisfaction of the Secretary within three months of:

- (a) The submission of an Annual Environmental Management Report
- (b) The submission of an incident report
- (c) The submission of an Independent Environmental Audit Report
- (d) Any modification of the regulatory consent conditions
- (e) A direction of the Secretary under condition 1.2;

the Applicant must review and, if necessary, revise the studies, strategies or plans required under the conditions of approval to the satisfaction of the Secretary.

Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval, unless otherwise agreed with the Secretary.

Further details on the requirements for review and update of the EMPs are provided in the EMS.

4. Environmental management program

4.1 Objective

The objective of the AQMP is to establish an air quality management strategy that complies with the Development Consent conditions and other regulatory environmental requirements through:

- Identification of relevant health and air quality criteria (Section 4.2)
- Identification of major sources of particulate and gaseous air pollutants (Section 2.2)
- Formulation of an air quality monitoring programme (Section 4.4)
- Establishment of procedures for minimising gaseous and particulate emissions (Section 4.3)
- Establishment of a complaint protocol to facilitate prompt and comprehensive responses to community concerns that relate to air quality (Section 3.5)
- Establishment of a contingency plan for elevated air quality impacts (Section 4.5)
- Identification of reporting requirements (Section 3.6)

4.2 Performance standard

4.2.1 Air quality criteria

Table 5 and Table 6 present the relevant health and air quality criteria for the MSP, which will be considered for the monitoring and reporting of air quality. Table 5 and Table 6 summarise the air quality limits identified in:

- EPL 12314
- Relevant legislation and guidelines

Table 5 Criteria for air quality parameters

Emission	Location	Goal or Standard	Authority
Total Suspended Particulates (TSP)	In-stack ¹	50 mg/m ³	EPL 12314
Oxides of nitrogen (NO _x)	In-stack	350 mg/m ³	EPL 12314

Table 6 shows the amenity criteria for dust deposition. The EPL and development consent conditions require monitoring of deposited dust levels but do not specify the appropriate criteria for compliance. It is inferred that the MSP is required to comply with the criteria outlined in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW DEC 2017), which seek to limit the maximum increase in the mean annual rate of dust deposition.

Table 6 Criteria for dust

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

4.3 Environmental mitigation measures

- Carry out activities in a manner that will minimise the generation of wind-blown or traffic generated dust and the MSP.
- The air quality monitoring programme outlined in section 4.4 is implemented to assess air quality against acceptable levels as defined by the air quality standards (Section 3.2) and review of the air quality management measures.
- Obsolete access tracks used during construction are ripped and re-vegetated.
- Fixed irrigation and/or chemical dust suppressants are used on mineral product stockpiles and the waste material stockpile to minimise the generation of dust.
- Bag houses and ilmenite kiln wet scrubber are maintained to reduce emissions prior to exit from the stack.
- Devices are fitted to the leucoxene dryer stack and ilmenite dryer stack to warn operators of any malfunctions have occurred in the emission controls.
- Process equipment is maintained to manufacturer's specifications to minimise the potential for leaks and fugitive emissions. The maintenance regime in place also involves inspections (daily, weekly, monthly and bi-annually) of different process components. Data is collected from all metering points installed to assess the integrity of the equipment within performance parameters. All maintenance works must comply with applicable Australian and International Standards, codes of practice and guidelines.

The effectiveness of measures adopted from the above procedures will be assessed against the relevant criteria identified in Section 3.2. Further management strategies will be implemented as required.

4.4 Monitoring

Air quality monitoring points are established at the relevant monitoring/discharge points. An overview of the air quality monitoring program is provided in Table 7. The receiver locations and dust deposit gauges are shown on Figure 3. Locations of stacks and site general arrangement are shown on Figure 4.

Table 7 Monitoring summary for air quality management

Type of monitoring point	EPA No.	Pollutant	Units of measure	Frequency	Sampling Method
Dust deposition Dust deposit gauge (DBH3) Dust deposit gauge (DBH1) Dust deposit gauge (DBH4) PM10	1,2,4 5	Particulates – deposited matter High volume sampler – Particulate matter	g/m ² /month Micrograms per cubic metre	Monthly Every 6 days	Australian Standard 3580.10.1-1991 AS/NZS 3580.9.6:2003
Leucoxene Hygiene Bag House Stack	6	Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2
Ilmenite Hygiene Bag House Stack'	7	Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2
Leucoxene Dryer Stack"	10	Carbon dioxide	Percent	Yearly	TM-24
		Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Molecular weight of stack gases	g/g.mol (grams per gram mole)	Yearly	TM-23
		Nitrogen Oxides	g/m ³	Yearly	TM-15
		Oxygen (O ₂)	percent	Yearly	TM-25
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2
Ilmenite Dryer Stack	11	Carbon dioxide	Percent	Yearly	TM-24
		Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Molecular weight of stack gases	g/g.mol (grams per gram mole)	Yearly	TM-23
		Nitrogen Oxides	g/m ³	Yearly	TM-15
		Oxygen (O ₂)	percent	Yearly	TM-25
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2
Ilmenite Reheater Stack	12	Carbon dioxide	Percent	Yearly	TM-24
		Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Molecular weight of stack	g/g.mol	Yearly	TM-23

Ilmenite Reheater Stack		gases	(grams per gram mole)		
		Nitrogen Oxides	g/m ³	Yearly	TM-15
		Oxygen (O ₂)	percent	Yearly	TM-25
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2
	13	Carbon dioxide	Percent	Yearly	TM-24
		Dry Gas Density	Kg/m ³	Yearly	TM-23
		Moisture content	Percent	Yearly	TM-22
		Molecular weight of stack gases	g/g.mol (grams per gram mole)	Yearly	TM-23
		Nitrogen Oxides	g/m ³	Yearly	TM-15
		Oxygen (O ₂)	percent	Yearly	TM-25
		Temperature	Degree Celsius	Yearly	TM-2
		Total solid particulate	mg/m ³	Yearly	TM-15
		Velocity	m/s	Yearly	TM-2
		Volumetric flowrate	m ³ /s	Yearly	TM-2

As required by Conditions of Approval, all monitoring records must be kept for at least four years, maintained in a legible form and made available to authorised officers of the EPA. When collecting samples, the recorded information must include:

- The date when the samples were taken;
- The time at which the sample was taken;
- Where the sample was taken; and
- The name of the sampler.

At the time of collection air samples are visually checked for contamination (e.g. dead insects, bird poo). Any contaminated samples are not included in the analysis. A photograph of the contamination is taken and the reason for exclusion documented. This information is included when reporting to EPA (refer to section 3.6).

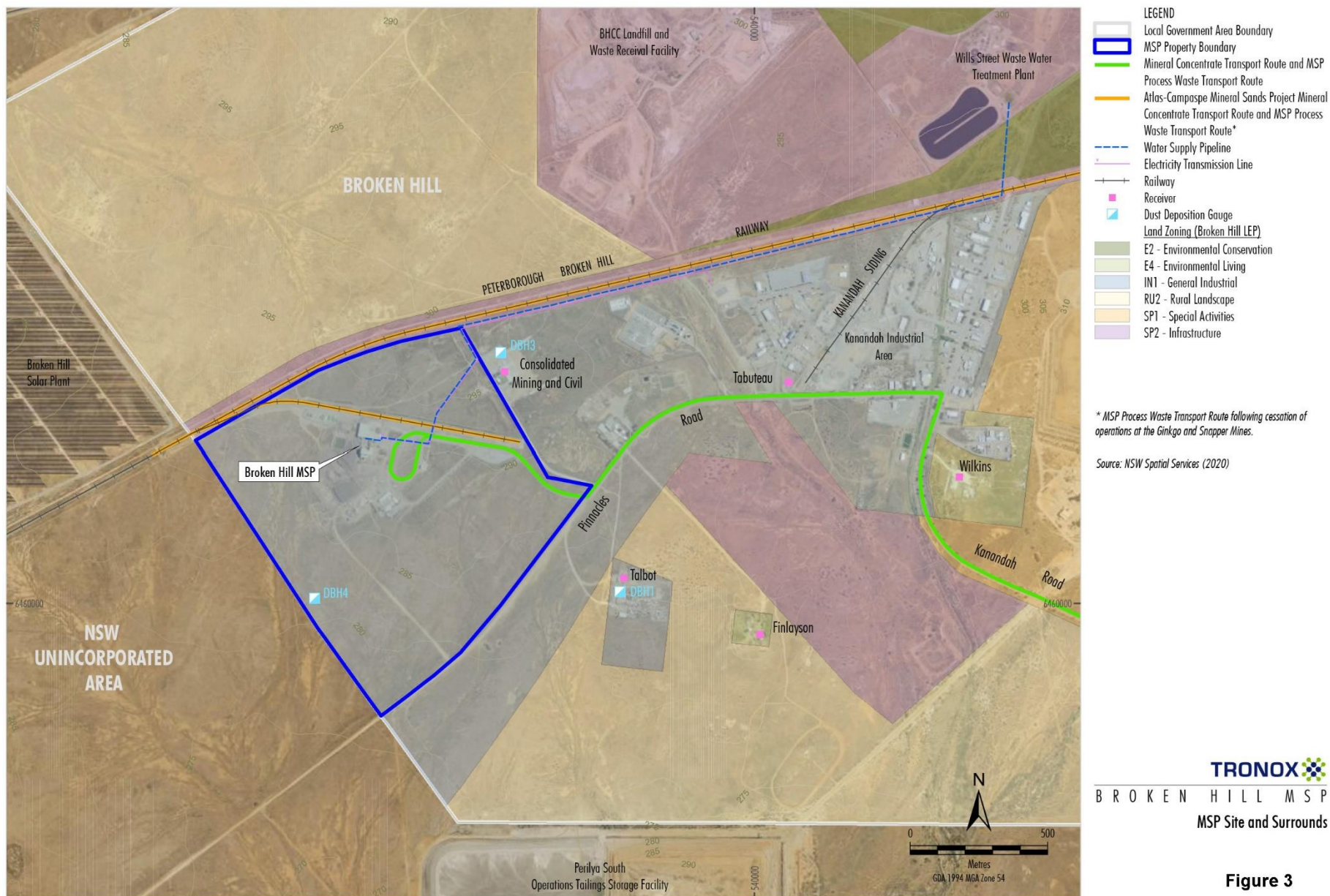
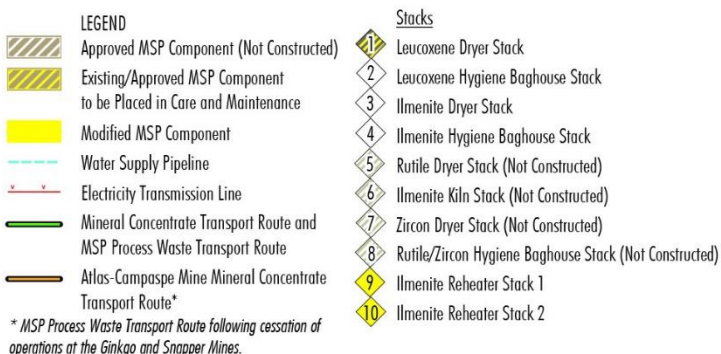


Figure 3: Location of Receivers and Dust Deposition Gauges



Source: NSW Spatial Services (2020)
Orthophoto: Google Earth (2020)



TRONOX

BROKEN HILL MSP

Existing/Approved and Modified
General Arrangement
Inset

Figure 4

Figure 4: Location of Stacks and General Arrangement

4.4.1 Meteorology

Meteorological data is obtained from the automated meteorological station operated by Bureau of Meteorology located at Broken Hill Airport. Data will include rainfall, wind speed, wind direction and temperature in the vicinity. When used in conjunction with the monitoring components outlined above, meteorological data will provide useful information for the review of air quality management practices.

4.4.2 Dust deposition

Static dust deposition gauges are installed at the Talbot residence (DG01), Consolidated Mining and Civil (DG03) and DG04 (Table 7 and Figure 3). Monthly analysis of dust deposition results will consider ash content, combustible matter and insoluble solids.

In accordance with Development Consent Condition 4.4 (b), dust deposition monitoring and analysis are conducted according to the *Australian Standard AS 3580.10.1-1991 Particulates – Deposited Matter – Gravimetric Method*.

4.4.3 Suspended particulate matter

PM₁₀ has previously been monitored using a high volume air sampler (Table 7 and Figure 3), which is sampled every six days. In November 2017, NSW EPA issued a variation of licence 12314, removing the requirement to monitor PM₁₀ at monitoring point 5. This monitoring plan has been updated accordingly with references to PM₁₀ crossed out in text and tables. PM₁₀ monitoring may be reinstated in the future in response to:

- A complaint(s) related to dust and air quality concerns from nearby residences. If investigations (as per section 4.5) indicates that the MSP is a potential source of air monitoring concerns, PM₁₀ monitoring may be undertaken to assess compliance of MSP operations against relevant guidance.
- Air monitoring at other monitoring points and subsequent review of this data that indicates exceedance of assigned limits or a trend towards decreasing air quality.
- Expansion of the MSP involving additional operations and activities that have been assessed as likely to impact on air quality (i.e., as per an environmental assessment undertaken for a modification to the Development Consent).

Tronox will consult with an Environmental Consultant, qualified in air quality monitoring and assessment, to assess the requirement for the reinstatement of PM₁₀.

4.4.4 Point source stack emissions

Table 7 lists the pollutants to be monitored for point source stack emissions, the units of measure, frequency of sampling and the sampling method to be utilised for each sample location as detailed in M2.2 of EPL 12314. Locations of stacks are shown on Figure 4. The baghouse stacks, (i.e. leucoxene hygiene baghouse stack, ilmenite hygiene baghouse stack), are not proposed to emit any nitrogen oxides and therefore monitoring of NO₂, NO or both as NO_x will only be conducted on the stacks for the dryers (leucoxene dryer stack, ilmenite dryer stack). Monitoring for the dryer stacks will also include percentage of CO₂ in the stack gases.

4.5 Contingency measures

The contingency plan outlined below has been developed to provide a plan of action should an incident, process upset or other initiating factor lead to elevated air quality impacts, whether above normal operating conditions, environmental performance goals or environmental limits.

The contingency plan can be broken into steps as follows:

1. Identify whether an incident, process upset or any other initiating factor has led to elevated air quality impacts
2. Assess the incident, process upset or any other initiating factor
3. Undertake procedures to alleviate air quality impacts
4. Review the success of the procedure/s used to alleviate air quality impacts

4.5.1 Incident identification

Elevated air quality impacts will be identified by the air quality monitoring programme (refer to section 4.4) or assessment of complaints (refer to section 3.5).

4.5.2 Incident assessment

Assessment of incidents and response to incidents are addressed in section 3.5.

4.5.3 Control and management procedures

In the event that an incident, process upset or any other initiating factor has led to elevated air quality impacts, procedures for addressing and resolving the incident, process upsets or other initiating factor and minimising gaseous and particulate emissions will be implemented.

Procedures for minimising gaseous and particulate emissions will be selected with consideration of:

- The source of the gaseous or particulate emission
- The location of the exceedance and the proximity to the MSP
- Possible reasons for the exceedance (including consideration of meteorological factors)
- The likely effectiveness and feasibility of the mitigation/management measures

4.5.4 Review of control and management procedures

The effectiveness of the adopted measures will be assessed against the relevant criteria identified in section 3.2. Further management strategies will be implemented as required.

5. References

Bemax (2001) Broken Hill Mineral Separation Plant New South Wales, Environmental Impact Assessment, Main Report and Appendices, prepared by Resource Strategies on behalf of Bemax Resources Pty Ltd, November 2001.

Tronox Mining Australia (2020) Broken Hill Mineral Separation Plant Modification, Modification Report, prepared by Resource Strategies on behalf of Tronox Mining Australia Pty Ltd, 2020.

Appendices

Appendix A Variation of Environmental Protection Licence No 12314

Licence Variation

Licence - 12314



TRONOX MINING AUSTRALIA LIMITED
PO BOX 444
BROKEN HILL NSW 2880

Attention: Brendan Isaacs

Notice Number 1609639
File Number EF13/2844
Date 12-Aug-2021

NOTICE OF VARIATION OF LICENCE NO. 12314

BACKGROUND

- A. TRONOX MINING AUSTRALIA LIMITED ("the licensee") is the holder of Environment Protection Licence No. 12314 ("the licence") issued under the *Protection of the Environment Operations Act 1997* ("the Act"). The licence authorises the carrying out of activities at PINNACLES ROAD, BROKEN HILL, NSW, 2880 ("the premises").
- B. On 09-Jun-2021 the Environment Protection Authority (EPA) received an application for the variation of the licence.
- C. On 30 June 2021, the EPA received an email from Brendan Isaacs requesting additional variations to the licence.
- D. On 6 July 2021, it was identified by the licensee that corrections to Condition M2.2 were needed to reflect air monitoring procedures onsite.
- E. The EPA has reviewed each of the requests and supporting information, and we have determined to vary the licence accordingly.

VARIATION OF LICENCE NO. 12314

1. By this notice the EPA varies licence No. 12314. The attached licence document contains all variations that are made to the licence by this notice.
2. The following variations have been made to the licence:
 - Condition P1.1- Additional of two new reheater stacks ('Ilmenite Reheater Stack 1' and 'Ilmenite Reheater Stack 2') and updated map references.
 - Condition L5.1- Alteration to construction hours.

Licence Variation



- Condition L5.1 and 5.2- Receiver location updated.
- Condition L5.2 and 5.3- Noise Policy reference updated to latest regulation document.
- Condition M2- Removal of outdated note referencing PM10 monitoring requirement.
- Condition M2.2- Air monitoring requirements for each point updated to incorporate new stacks and align requirements with actual onsite procedure.
- Condition E1.1- New Ilmenite reheater stacks added to this condition.
- Condition E2.2- Reference to outdated Clean Air Regulation removed.

.....
Darren Walleit
A/Regional Manager
Environment Protection Authority
(by Delegation)

INFORMATION ABOUT THIS NOTICE

- This notice is issued under section 58(5) of the Act.
- Details provided in this notice, along with an updated version of the licence, will be available on the EPA's Public Register (<http://www.epa.nsw.gov.au/prpoeo/index.htm>) in accordance with section 308 of the Act.

Appeals against this decision

- You can appeal to the Land and Environment Court against this decision. The deadline for lodging the appeal is 21 days after you were given notice of this decision.

When this notice begins to operate

- The variations to the licence specified in this notice begin to operate immediately from the date of this notice, unless another date is specified in this notice.
- If an appeal is made against this decision to vary the licence and the Land and Environment Court directs that the decision is stayed the decision does not operate until the stay ceases to have effect or the Land and Environment Court confirms the decision or the appeal is withdrawn (whichever occurs first).

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