Government of Western Australia
Department of Water and Environmental Regulation

Licence

Licence number	L4504/1981/17
Licence holder	South32 Worsley Alumina Pty Ltd
ACN	008 905 155
Registered business address	Gastaldo Road, Collie 6225
DWER references	DER2017/001998-1 APP-0026513
Duration	30/09/2025 to 30/09/2045
Date of issue	24/09/2015
Date of amendment	08/09/2025
Premises details	Worsley Alumina Refinery Gastaldo Road ALLANSON WA 6225 Lease No 3116/7574 being Wellington Locations 5314 – 5317 on Plan 220209 Certificates of Title Volume LR3080 Folios 471 - 474 As defined in Schedule 1

Prescribed premises category description (Schedule 1, ***Environmental Protection Regulations 1987***)	**Assessed production / design capacity**
Category 5: Processing or beneficiation of metallic or non-metallic ore	18.5 Mega tonnes per annual period (dry production capacity)
Category 46: Bauxite refining	4.7 million tonnes per annual period assessed production capacity
Category 52: Electric power generation	232 Mega Watts per annual period design capacity
Category 53: Flyash disposal	102,000 tonnes per annual period assessed production capacity
Category 54: Sewage facility	270 cubic metres per day design capacity
Category 61: Liquid Waste Facility	100 tonnes per annual period assessed production capacity
Category 63: Class I Inert landfill site	72,000 tonnes per annual period assessed production capacity
Category 67: Fuel burning	Gas input 44,300 kg per hour, coal input 163,200 kg per hour
Category 89: Putrescible landfill site	500 tonnes per annual period assessed production capacity

This licence is granted to the licence holder, subject to the attached conditions, on 8 September 2025, by:

Caron Goodbourn
Digitally signed by Caron Goodbourn
Date: 2025.09.08 15:22:29 +08'00'

MANAGER, PROCESS INDUSTRIES

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Licence history

Date	Reference number	Summary of changes
28/09/2006	L4504/1981/10	Licence re-issue
27/09/2007	L4504/1981/11	Licence re-issue. Throughput increased to 3.7 million tonnes per annum.
14/08/2008	W4430/2008/1	Works approval to allow construction of MCF Boiler 5
14/08/2008	W4432/2008/1	Works approval to allow construction of MCF Boiler 6, Calciner 6 and increase capacity to 4.7 million tonnes per year.
25/09/2008	L4504/1981/12	Licence re-issue
24/09/2009	L4504/1981/13	Licence re-issue
24/09/2010	L4504/1981/14	Licence re-issue
29/09/2011	L4504/1981/15	Licence re-issue
24/08/2012	L4504/1981/15	Proponent amendment to increase production to 4.7 million tonnes per annum and allow operation of Boiler Unit 5 and Calciner 6.
20/09/2012	L4504/1981/16	Licence re-issue
27/11/2014	L4504/1981/16	Amendment to include improvement conditions.
15/01/2015	L4504/1981/16	Amendment to change Calciner 6 targets, remove Boiler 5 and convert to REFIRE format including a review of existing conditions.
16/04/2015	L4504/1981/16	Amendment to remove the requirement to monitor CO using CEMS on emission point A4 and replace with monitoring of RTO bed temperature as an indicator of VOC destruction.
24/09/2015	L4504/1981/17	Licence reissue and amendment to change the occupier's name to South32 Worsley Alumina Pty Ltd, extend reporting due date, add category 61 liquid waste facility and administrative changes.
29/04/2016	L4504/1981/17	DWER initiated amendment to extend the licence duration
04/08/2016	L4504/1981/17	Amendment Notice 1: Licence amended to include Minister's Appeal Determination (Appeal no: 80 of 2015) and extend the compliance date of Condition 4.1.1, table 4.1.1 (IR2) until the 30 November 2016.
11/11/2016	L4504/1981/17	Licence amended to include Boiler 5 and Boiler 6 and remove ambient SO_2 monitoring stations Willis and 303.

28/07/2017	L4504/1981/17	Amendment Notice 2: approval to construct and operate an additional process water storage dam – water body 1. Conditions 1.2.8 to 1.2.13 added in the licence. IR conditions IR2 and IR3 were removed from the licence. Also some administrative corrections conducted.
16/10/2017	L4504/1981/17	Amendment Notice 3: • Construction of an oxalate tipping area (tip plate) on the banks of SEP1; • Installation of an oxalate slurry hopper to receive the oxalate cake, sprinklers, an agitator, electrical infrastructure, pumps and a floating slurry release line into SEP1; • A pontoon pump for recovery of water and a delivery line from SEP 1 into the hopper (via sprinkler system) Conditions 1.2.14 to 1.2.18 were added in the licence.
10/03/2020	L4504/1981/17	Amendment to include the two B&W Type “D” package boilers as prime energy generation units, incorporate the newly installed CEMS monitoring for Boilers 1-3. Also includes a DWER initiated licence amendment to consolidate separately issued amendment notices 1 to 3 into the licence.
25/06/2020	L4504/1981/17	Amendment to include the construction and operation of a sodium oxalate storage facility at SEP4 and to remove the requirement to monitor ambient SO_2. The amendment also includes a DWER initiated amendment to consolidate separately issued amendments into the licence.
09/11/2020	L4504/1981/17	CEO initiated amendment to correct typographical errors in condition 2.2.2.
27/01/2022	L4504/1981/17	CEO initiated amendment to: • update the actual fly ash deposition production capacity on the front page of the Licence to reflect the actual deposition rate from 65,000 tonnes per annum to 1000,000 tonnes per annum; • inclusion of fly ash as a waste in Condition 1.2.3 Table 1.2.2 Waste processing; • correct typographical errors in condition 4.2.1, 4.2.2 and 4.2.3; and consolidation and clarification of existing reporting requirements
03/03/2023	L4504/1981/17	Amendment application to convert SEP 2A into a sodium oxalate storage facility.
24/05/2023	L4504/1981/17	Amendment application to convert the burners, ignitors and associated infrastructure from coal to natural gas for Boilers 1, 2 and 3 in Facility 110.
12/08/2024	L4504/1981/17	Department initiated amendment to extend the licence duration by 12 months.
08/09/2025	L4504/1981/17	Department-initiated Licence amendment (partial review) which comprises: • addition of Categories 5 and 67; • reduction of electric power generation from 260 Mega Watts to 232 Mega Watts per annual period design capacity.

		• reduction of flyash deposition production capacity from 110,000 tonnes per annum to 102,000 tonnes per annual period; • increase of deposition of Class I Inert landfill materials from 15,000 tonnes to 72,000 tonnes per annual period; and • extend expiry date by 20 years.

Interpretation

In this licence:

(a) the words 'including', 'includes' and 'include' in conditions mean "including but not limited to", and similar, as appropriate;

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a condition, each row in a table constitutes a separate condition;

(d) any reference to an Australian or other standard, guideline, or code of practice in this licence:

(i) if dated, refers to that particular version; and

(ii) if not dated, refers to the latest version and therefore may be subject to change over time;

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act; and

(f) unless specified otherwise, all definitions are in accordance with the EP Act.

NOTE: This licence requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this licence.

Licence conditions

The licence holder must ensure that the following conditions are complied with:

General

1. The licence holder must ensure that wastes accepted into the landfill and wastewater treatment plant are subject to the processes and quantities set out in Table 1.

Table 1: Waste processing

Item	Waste type	Process	Process limits[1,2]
1	Bauxite residue	Disposal in Bauxite Residue Disposal Areas (BRDAs)	18.5 million tonnes per annual period (dry production capacity)
2	Oxalate	Disposal in BRDAs to be covered with bauxite residue immediately following disposal. Oxalate disposal in SEP1, SEP 2A, SEP3 and SEP4 to be moist or maintained underwater or beneath a full surface cover	

Item	Waste type	Process	Process limits[1,2]
		immediately following disposal.	
3	Fly ash	Disposal in BRDAs	102,000 tonnes per annual period
4	Inert Waste Type 1	Handling and disposal of waste by landfilling. Disposal of waste by landfilling must only take place within the landfill cells.	72,000 tonnes per annual period
5	Inert Waste Type 2[1,2]		
6	clean fill		
7	Waste generated from alumina production and associated activities excluding: (i) elemental mercury, (ii) asbestos materials, (iii) packaged laboratory chemical wastes, and (iv) clinical wastes		
8	Putrescible waste		500 tonnes per annual period assessed production capacity
9	Sewage and wastewater from pressure testing of the premises' tanks.	Sequence Batch Reactor (SBR) Treated wastewater to be disposed to the Refinery Catchment Lake only	270 cubic metres per day design capacity

Note 1: Requirements for landfilling tyres are set out in Part 6 of the Environmental Protection Regulations 1987.

Note 2: Additional requirements for the acceptance and landfilling of controlled waste (including asbestos and tyres) are set out in the Environmental Protection (Controlled Waste) Regulations 2004

2. The licence holder must have waste materials stored and/or treated within vessels or infrastructure as detailed in Table 2 and as identified on Figure 1 and Figure 4 in Schedule 1.

Table 2: Containment Infrastructure

Item	Containment infrastructure	Contained materials	Containment/operational requirements
1	BRDA 1, 2, 4, 4X and 5	Bauxite residue, oxalate and controlled liquid waste	a. Low permeability clay liner b. Liquor collection system installed (pipework and decant) to transport liquor to the pipehead dams (PHDs). c. Groundwater underflow

Item	Containment infrastructure	Contained materials	Containment/operational requirements
			collection pipes to collect groundwater and relieve pressure on liners and allow detection of any residue liquor. d. Groundwater is transported to the PHDs.
2	Landfill (Decommissioned BRDA 3)	Inert Waste Type 1 and 2 Clean fill Putrescible waste Wastes generated from alumina production and associated activities. Excludes: (i) Elemental mercury (ii) Asbestos materials (iii) Packaged laboratory chemical wastes; and (iv) Clinical wastes Historic bauxite residue, oxalate and controlled liquid waste	a. Low permeability clay liner b. Liquor collection system installed (pipework and decant) to transport liquor to PHDs. c. Groundwater underflow collection pipes to collect groundwater and leachate to relieve pressure on liners and allow detection of any residue liquor. d. Groundwater is transported to the PHDs.
3	Fresh Water Lake (FWL)	Uncontaminated surface water and groundwater from within the refinery lease.	a. None.
4	Pipehead Dams (PHDs)	NPHD – residue liquor from BRDAs 1, 2, 4, 4X and the landfill SPHD – residue liquor from BRDA 5	a. Low permeability clay liner with a chemical grout curtain installed below the earth embankment to prevent downstream migration of high pH residue liquor. b. Depressurisation bores located upstream to ensure groundwater is directed to bores and not lower parts of the catchment.
5	Refinery Catchment Lake (RCL)	Recirculated process cooling water from Refinery, residue liquor from PHD's, potentially impacted stormwater, and outflow from the Sequence Batch Reactor	a. Low permeability clay liner.
6	Sewage sludge vessels (Sewage Treatment Plant)	Sewage sludge	a. Enclosed tanks which return sludge leachate to the start of the Sequence Batch Reactor process.

Item	Containment infrastructure	Contained materials	Containment/operational requirements
7	Solar Evaporation Pond (SEP) 1, 4 and 2A	Oxalate	a. HDPE liner with a permeability of 10^{-9} m/s and slotted underflow pipes to collect groundwater which may impact on the base of the liners. b. a minimum top embankment freeboard of 500 mm is maintained at all times c. conduct periodic assessment of permeability of the composite HDPE/GCL liner; and d. undertake remedial action/repairs as required to the liner and underdrainage system.
8	SEP3	Oxalate	a. PVC lined with a permeability of 10^{-9} m/s; b. a minimum top embankment freeboard of 500 mm is maintained at all times c. conduct periodic assessment of permeability of the PVC liner d. undertake remedial action/repairs to the liner as required
9	Water Body 1	Process water and decant water balancing pond	a. HDPE lined with a permeability of 10^{-9} m/s and slotted underflow pipes to collect groundwater and seepage which may impact on the base of the liners. b. conduct periodic integrity test of permeability of the composite HDPE/GCL liner c. undertake remedial action/repairs to the liner and underdrainage system as required; and d. a minimum top embankment freeboard of 500 mm is maintained at all times.

3. The licence holder must manage the landfilling activities to ensure:

(a) waste is placed within the designated area within the landfill;
(b) waste is covered with clean fill, bauxite residue, sand or other similar material on a minimum weekly basis; and
(c) a register of waste disposed of to landfill cells is maintained.

4. The licence holder must store oxalate in the BRDAs and/or SEPs in a manner which ensures it remains moist or maintained underwater or beneath a full surface cover that ensures dust is not generated from oxalate storage.

5. The licence holder must ensure that the total quantity of alumina produced does not exceed 4,700,000 tonnes per annual period.

6. The licence holder must construct/ install the infrastructure and/or equipment;

(a) in accordance with the corresponding design and construction / installation requirements;

(b) at the corresponding infrastructure location; and

(c) within the corresponding timeframe,

as set out in Table 3

Table 3: Design and construction / installation requirements

Infrastructure	Design and construction / installation requirements	Infrastructure location	Timeframe
Stage 3 Boiler 2 (A2)	Remove existing coal burners and gas igniters. Retrofit eight gas burners that are: Tangentially fired with air/gas mixing nozzles for low NOx generation and have a titling mechanism	Identified as A2 in Figure 2 'Map of emissions Points' in Schedule 1	December 2029

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7. The licence holder must within 60 calendar days of the infrastructure or equipment required by condition 6 being constructed and/or installed:

(a) undertake an audit of their compliance with the requirements of condition 6; and
(b) prepare and submit to the CEO an audit report on that compliance.

8. The Environmental Compliance Report required by condition 7, must include as a minimum the following:

(a) certification by an independent Chemical/Electrical Engineer that the component(s) thereof, as specified in condition 6, have been constructed in accordance with the relevant requirements specified in condition 6;
(b) as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in condition 6; and
(c) be signed by a person authorised to represent the licence holder and contains the printed name and position of that person

Emissions

General

9. The licence holder shall record and investigate the exceedance of any descriptive or numerical limit or target specified in any part of this Licence.

Air Emissions

10. The licence holder must ensure that where waste is emitted to air from the emission points in Table 4 and identified on the map of emission points in Schedule 1 is done so in accordance with the conditions of this Licence.

Table 4: Emission points to air

Emission point reference[1]	Emission Point Identifier	Emission point height (meters)	Source, including any abatement
A1	Boiler Flue 1	76	Gas-fired boilers with low NOx burners (tangentially fired, mixed air/gas low NOx nozzle with a tilting mechanism)

Emission point reference[1]	Emission Point Identifier	Emission point height (meters)	Source, including any abatement
A2	Boiler Flue 2		Coal Fired Power Station Boiler Unit 2 via Electrostatic Precipitator; or Gas-fired boilers with low NOx burners (tangentially fired, mixed air/gas low NOx nozzle with a tilting mechanism)
A3	Boiler Flue 3		Gas-fired boilers with low NOx burners (tangentially fired, mixed air/gas low NOx nozzle with a tilting mechanism)
A4	Digestion (RTO) Stack	40	Digestion Unit 1 and 2 via RTO
A5	Calciner Stack 1		Calciner 1 via Electrostatic Precipitator
A6	Calciner Stack 2		Calciner 2 via Electrostatic Precipitator
A7	Calciner Stack 3		Calciner 3 via Electrostatic Precipitator
A8	Calciner Stack 4		Calciner 4 via Electrostatic Precipitator
A9	Calciner Stack 5		Calciner 5 via Electrostatic Precipitator
A10	Calciner Stack 6	60	Calciner 6 via Baghouse
A11	Liquor Burner (RTO) Stack	105	Liquor Burner Facility via Baghouse, wet scrubber and RTO
A13	MFC Boiler Flue 5	90	Multi Fuel Cogeneration Power Plant Boiler Unit 5, via baghouse. Maximum biomass fuel use of 30% (thermal substitution)
A14	MFC Boiler Flue 6		Multi Fuel Cogeneration Power Plant Boiler Unit 6, via baghouse. Maximum biomass fuel use of 30% (thermal substitution)
A15	Packaged Boiler 4	17.6	Babcock and Wilcox Type D Package Boiler
A16	Packaged Boiler 5		

Note 1: identified on ‘Map of emission points’ in Schedule 1

11. The licence holder must sample and monitor emissions from point source emissions to air at or below the levels specified in Table 5.

Table 5: Sampling and monitoring of point source emission to air with targets and limits

Emission Point	Facility Name	Source including abatement	Emissions	Target (mg/Nm3) [1, 2, 35]	Limit (mg/Nm3)	Sampling and averaging period	Frequency[4]	Method
A1 and A3	Facility 110 Powerhouse Boilers	Gas fired boilers – low NOx burners	Carbon monoxide		150	Stack test (30min avg)	Quarterly	USEPA Method 10
			Nitrogen oxides	420		CEMS (60min avg)	Continuous	CEMS
					450	Stack test (30min avg)	Annual	USEPA Method 7E
			Acetaldehyde & Formaldehyde	-		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A2	Facility 110 Powerhouse Boilers	Coal fired boiler – Electrostatic precipitators	Carbon monoxide	88		CEMS (60min avg)	Continuous	CEMS
			Nitrogen oxides	990				
			Sulfur dioxide	2200				
			PM	150		Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A

				150		CEMS (60min avg)	Continuous[5]	CEMS via suitable annual correlation of referenced particulates
			PM10	-		Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
			Metals – As, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Zn	-		Stack test (60min avg)	Annual	USEPA Method 29
			Hydrogen Fluoride	4.8		Stack test (60min avg)	Annual	USEPA Method 26 or 26A
A4	Digestion (RTO)	Regenerative thermal oxidizer	Carbon monoxide	100		Stack test (30min avg)	Quarterly	USEPA Method 10
			Benzene	3.5				USEPA Method 18
			Mercury	67.2		Stack test (60min avg)		USEPA Method 29
			Acetaldehyde	7.0				USEPA SW846 Method 0011
			Formaldehyde	6.3				
A5-A8	Calciner 1-4	Electrostatic precipitators	Carbon monoxide		330	Stack test (30min avg)	Quarterly	USEPA Method 10
			Nitrogen oxides		220			USEPA Method 7E
			PM	250		CEMS (60min	Continuous[5]	CEMS via suitable

						avg)		annual correlation of referenced particulates
					400	Stack test (60min avg)	Quarterly	USEPA Method 5, 17 or 201A
			PM10	-		Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			Metals – As, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Zn	-		Stack test (60min avg)	Annual	USEPA Method 29
			Benzene	2		Stack test (30min avg)	Quarterly	USEPA Method 18
			Acetaldehyde	14.4		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Formaldehyde	11.5		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A9	Calciner 5	Electrostatic precipitators	Carbon monoxide		330	Stack test (30min avg)	Quarterly	USEPA Method 10
			Nitrogen oxides		220			USEPA Method 7E

			PM	150		CEMS (60min avg)	Continuous[5]	CEMS via suitable annual correlation of referenced particulates
					250	Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			PM10	-		Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			Metals – As, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Zn	-		Stack test (60min avg)	Annual	USEPA Method 29
			Benzene	2		Stack test (30min avg)	Quarterly	USEPA Method 18
			Acetaldehyde	14.4		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Formaldehyde	11.5		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A10	Calciner 6	Bag house	Carbon monoxide		220	Stack test (30min avg)	Quarterly	USEPA Method 10
			Nitrogen oxides		220			USEPA Method 7E
			PM	80		CEMS (60min avg)	Continuous[5]	CEMS via suitable

								annual correlation of referenced particulates
				-	150	Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			PM10	-		Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			Metals – As, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Zn	-		Stack test (60min avg)	Annual	USEPA Method 29
			Benzene	2		Stack test (30min avg)	Quarterly	USEPA Method 18
			Acetaldehyde	14.4		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Formaldehyde	11.5		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A11	Liquor burner (RTO)	Bag house, wet scrubber and RTO	Carbon monoxide	100		CEMS (60min avg)	Continuous	CEMS
					120	Stack test (30min avg)	Quarterly	USEPA Method 10

			Nitrogen oxides	245	350	Stack test (30min avg)		USEPA Method 7E
			Benzene	3.5		Stack test (30min avg)	Quarterly	USEPA Method 18
			Acetaldehyde	7		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Formaldehyde	6.3		Stack test (60min avg)	Annual	USEPA SW846 Method 0011
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A13-A14	Multi fuel Cogeneration (MFC) Boiler Flue 5 & 6	Bag house and limestone injection	Carbon monoxide	100		CEMS (60min avg)	Continuous	CEMS
					140	Stack test (30min avg)	Annual	USEPA Method 10
			Nitrogen oxides	500		CEMS (60min avg)	Continuous	CEMS
				-	600	Stack test (30min avg)	Annual	USEPA Method 7E
			Sulfur dioxide	600		CEMS (60min avg)	Continuous	CEMS
				-	800	Stack test (30min avg)	Annual	

			PM	80		CEMS (60min avg)	Continuous[5]	CEMS via suitable annual correlation of referenced particulates
				-	150	Stack test (60min avg)	Annual	USEPA Method 5, 17 or 201A
			Hydrogen Fluoride	2		Stack test (60min avg)	Annual	USEPA Method 26 or 26A
			Metals – As, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Zn	-		Stack test (60min avg)	Annual	USEPA Method 29
			Total Volatile Organic Compounds	-		Stack test (30min avg)	Annual	USEPA Method 18
A15-A16	Package Boiler 4-5	Babcock and Wilcox Type D Package Boiler	Carbon monoxide		125	Stack test (30min avg)	Quarterly	USEPA Method 10
			Nitrogen oxides		350			USEPA Method 7E
			Volatile Organic Compounds	40		Stack test (30min avg)	Annual	USEPA Method 18

Note 1: All units are referenced to STP dry.
Note 2: Concentration units for A1 and A3 are referenced to 3% O_2. Concentration units for A2 are referenced to 7% O_2. Concentration units for A5-A9 are referenced to 6% O_2. Concentration unit for A10 is referenced to 9% O_2. Concentration unit for A12 are referenced to 15% O_2. Concentration units for A13-A14 are referenced to 7% O_2. Concentration units for A15-A16 is referenced to 3% O_2. When continuous oxygen correction is not available and for parameters requiring CEMS, targets shall not be achieved by the addition of dilution gases.
Note 3: All targets and limits apply during normal operating conditions
Note 4: Monitoring shall be undertaken to reflect normal operating conditions and any limits or conditions on inputs or production.
Note 5: Continuous monitoring is required once CEMS are installed and operational in accordance with the CEMS Code.

12. The licence holder must ensure that sampling required under Condition 11 of the Licence is undertaken at sampling locations in accordance with the AS 4323.1 or relevant part of the CEMS Code.

13. The licence holder must ensure that all non-continuous sampling and analysis undertaken pursuant to Condition 11 is undertaken by a holder of NATA accreditation for the relevant methods of sampling and analysis.

14. For any parameter in Table 5 requiring continuous monitoring, the licence holder must ensure that the CEMS is regularly maintained and calibrated in accordance with the CEMS Code.

15. The licence holder must take the specified management action in the case of an event in Table 6

Table 6: Management actions

Emission point reference	Event/action reference	Event	Management action
A1 – A3 A5 – A11 A13 – A14	EA1a	Parameters monitored by CEMS exceed the target specified in Table 5	The licence holder shall submit a quarterly summary of environmental controls for an emission point that triggers EA1a or EA1b and include: (a) An analysis of the root cause(s) and contributing factors of the target exceedances; and (b) Short- and long-term corrective actions taken or planned to prevent reoccurrence of the exceedances, including timelines for implementation.
A1 – A16	EA1ab	Parameters monitored by stack tests exceed the target specified in Table 5	
A1 – A3 A5 – A10 A13 – A14	EA2	USEPA Performance Specification 11 CEMS correlation via manual stack sampling causes an exceedance of particulates target.	The licence holder shall notify the CEO in writing 7 days prior to the commencement of the annual CEMS calibration curve correlation.
A4	EA4	Digestion Unit 1 (RTO60) or 2 (RTO70) average RTO bed temperature falls below target temperature in Table 7.	The licence holder shall initiate shut down of the digestor RTO unit.
A11	EA3	Online instrumentation identifies the failure of 3 or more baghouse cells.	The licence holder shall immediately initiate shut down of the Liquor Burner.

16. The licence holder must take all practical measures to ensure that the process control parameters in Table 7 comply with the specified requirements.

Table 7: Process controls for emissions to air

Parameter	Target	Frequency
Digestion Unit 1 (RTO60) and 2 (RTO70) average RTO bed temperature	700°C or greater	Continuous

Monitoring

17. The licence holder must ensure that all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured

18. The licence holder must ensure that:

(a) monitoring is undertaken in each quarterly period such that there are at least 45 days in between the days on which samples are taken in successive quarters;

(b) monitoring is undertaken in each six-monthly period such that there are at least 5 months in between the days on which samples are taken in successive periods of six months; and

(c) monitoring is undertaken in each annual period such that there are at least 9 months in between the days on which samples are taken in successive years.

19. The licence holder must ensure that all monitoring equipment used on the Premises to comply with the conditions of this Licence is calibrated in accordance with the manufacturer's specifications and the requirements of the Licence and any relevant Australian standard.

20. The licence holder must, where the requirements for calibration cannot be practicably met, or a discrepancy exists in the interpretation of the requirements, bring these issues to the attention of the CEO accompanied with a report comprising details of any modifications to the methods

21. The licence holder must undertake the monitoring in Table 8 according to the specifications in that table

Table 8: Process monitoring

Monitoring point reference	Process description	Parameter	Unit	Frequency
Digestion Unit 1 (RTO60) Bed Htr A Bed Hrt B Centre	VOC destruction	Temperature	°C	Continuous
Digestion Unit 2 (RTO70) Bed Htr A Bed Hrt B Centre				

22. The licence holder must undertake the meteorological monitoring in Table 9 according to the specifications in that table.

Table 9: Meteorological monitoring

Monitoring point reference	Parameter	Units	Height	Method	Infrastructure location
RMS	Wind speed	m/s	10m	AS 3580.14	Identified as RMS on Figure 3 'Map of ambient air emission monitoring sites' in Schedule 1
	Wind direction	Degrees			
	Wind direction std deviation				
	Air temperature	°C	2m		
	Relative humidity	%			
	Solar radiation	W/m^2	Not specified		

23. The licence holder must ensure that the monitoring equipment is operated and calibrated in accordance with the required methodology and is maintained to provide valid data for greater than 90% of the measurement intervals in every calendar month, and greater than 95% of the measurement intervals over any 12 consecutive calendar months.

24. The licence holder must undertake the monitoring in Table 10 according to the specifications in that table.

Table 10: Monitoring of inputs and outputs

Input/output	Parameter	Units	Frequency
Alumina	Production rates	tonnes	Annually
			Daily during stack test monitoring carries out in accordance with Table 5
Biomass	Thermal substitution of biomass (emission points A13 and A14)	%	Monthly

Records and reporting

Records

25. The licence holder must record the following information in relation to complaints received by the licence holder (whether received directly from a complainant or forwarded to them by the Department or another party) about any potential environmental impacts caused by the activities undertake at the premises:

(a) the name and contact details of the complainant, (if provided);

(b) the time and date of the complaint;

(c) the complete details of the complaint and any other concerns or other issues raised; and

(d) the complete details and dates of any action taken by the licence holder to investigate or respond to any complaint.

26. The licence holder must maintain accurate and auditable books including all records, information and records required by this licence, including:

(a) incidents where operation requirements as listed in table 2 have occurred and required management actions;

(b) monitoring programmes undertaken in accordance with conditions 11, 21, 22 and 24 of this licence; and

(c) complaints received under condition 25 of this licence.

27. The books specified under condition 25 must:

(a) be legible;

(b) if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;

(c) with the exception for records listed in 27(d) all records must be retained for at least 6 years from the date the records were made or until the expiry of the Licence or any subsequent licence;

(d) for those following records, be retained until the expiry of the Licence and any subsequent licence:

(i) off-site environmental effects; or

(ii) matters which affect the condition of the land or waters; and

(e) be available to be produced to an inspector or the CEO as required.

Reporting

28. The licence holder must:

(a) undertake an audit of their compliance with the conditions of this licence during the preceding annual period, and

(b) prepare and submit to the CEO an Annual Audit Compliance Report (AACR) in the approved form by 30 September each year.

29. The licence holder must:

(a) prepare an Annual Environmental Report that provides information in accordance with Table 11 for the preceding annual period,

(b) ensure that the Annual Environmental Report includes an assessment of the information contained within the report against previous monitoring results and Licence limits and/or targets, and

(c) submit that Annual Environmental Report to the CEO by 30 September each year.

Table 11: Annual Environmental reporting requirements

Condition or table	Requirement	Format or form
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken.	None specified
Condition 1	Summary of entries into the waste register including the total volume of each waste type	Table
Condition 3	Plan of the location of landfill cells used during the annual reporting period	Map
Condition 5	Production summary of the quantity of alumina refined during the annual period	None specified
Condition 11 Table 5	Results of quarterly, biannual and annual stack testing	Table and/or graph
	Summary of CEMS data	
	Trend analysis of results for both CEMS and stack test data for each emission point reference	Table and/or graph with descriptive explanation where the targets specified in Table 5 are exceeded for that emission reference point
	Monthly averaging of CEMS data with a compliance of 95% of the set targets to account for normal process variability and upsets.	
Condition 14	Relative Accuracy Test Audit (RATA) conducted at least once per annual period and in accordance with the CEMS Code	RATA1
Condition 15 Table 6	Summary of specified management actions for each emission point reference over the previous 3 years commencing from the 2021-2022 annual reporting period	None specified
Conditon 21 Table 8	Summary of Digestor RTO bed temperature monitoring for each unit over the annual period	None specified
Condition 24 Table 10	Summary of results for each parameter over the annual period.	None specified
	Average daily coal sulphur content for five days preceding stack test monitoring carried out in accordance with Table 5 (emission point A2)	Table and/or graph
	Biomass substitution during stack test monitoring carried out in accordance with Table 5 (emission points A13 and A14)	Table and/or graph
Condition 25	Complaints summary	None specified

30. The licence holder must submit the information in Table 12 to the CEO according to the specifications in that table

Table 12: Non-annual reporting requirements

Condition or table	Parameter	Reporting period	Reporting date	Format or form
-	Copies of	Not	Within 14 days of the	As received

Condition or table	Parameter	Reporting period	Reporting date	Format or form
	original monitoring reports submitted to the licence holder by third parties	Applicable	CEOs request	
Conditions 11 and 16 Tables 5 and 7	Exceedance of any descriptive or numerical target and limit	Quarterly	Within 35 days of the end of the quarter	ET1 and Quarterly monitoring Report
Conditon 15 Table 6	Specified management actions	Quarterly	Not more than 35 days after the end of the quarter in which the Licensee identified that an exceedance occurred.	Quarterly monitoring report

31. The licence holder must ensure that results from CEMS are made available on request as tabulated data and time series graphs including

(a) dates and times;

(b) unavailability of abatement;

(c) target or limit exceedances; and

(d) an assessment of the information contained within the report against previous submissions and licence limits and/or targets.

Notification

32. The licence holder must ensure that the parameters listed in Table 13 are notified to the CEO in accordance with the notification requirements of the table

Table 13: Notification requirements

Condition or table	Parameter	Notification requirement	Format or form
-	Breach of any limit specified in the Licence	Part A: As soon as practicable, but no later than 5pm on the next usual working day. Part B: Within 7 working days of becoming aware of the exceedance.	N1
20	Calibration report	As soon as practicable.	None specified

Definitions

In this licence, the terms in Table 4 have the meanings defined.

Table 14: Definitions

Term	Definition
ACN	Australian Company Number
Annual Audit Compliance Report (AACR)	means a report submitted in a format approved by the CEO (relevant guidelines and templates are available on the Department's website).
annual period	a 12-month period commencing from 1 July until 30 June of the immediately following year.
asbestos	the asbestiform variety of mineral silicates belonging to the serpentine or amphibole groups of rock-forming minerals and includes actinolite, amosite, anthophyllite, chrysolite, crocidolite, tremolite and any mixture containing 2 or more of those.
AS 3580.14	means the Australian Standard AS 3580.14 Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications
AS 4323.1	means the Australian Standard AS4323.1 Stationary Source Emissions Method 1: Selection of sampling positions
averaging period	means the time over which a limit or target is measured or a monitoring result is obtained
Biomass fuel	means fuel derived from untreated wood waste sourced from pine plantations or native forest
BRDA	means Bauxite Residue Disposal Area
biannual	means twice per year.
books	has the same meaning given to that term under the EP Act.
CEMS	means continuous emissions monitoring system
CEMS Code	means the current version of the Continuous Emission Monitoring System (CEMS) Code for Stationary Source Air Emissions, Department of Environment & Conservation, Government of Western Australia
CEO	means Chief Executive Officer of the department. "submit to / notify the CEO" (or similar), means either: Director General Department administering the *Environmental Protection Act 1986* Locked Bag 10 Joondalup DC WA 6919 or: info@dwer.wa.gov.au

Term	Definition
Chemical/Electrical Engineer	means a person who: (a) holds a tertiary qualification in chemical/electrical engineering; and (b) has a minimum of ten years of experience working in the area of natural gas combustion; and (c) holds membership of the Institute of Engineers Australia, or is otherwise approved by the CEO to act in this capacity
Clean Fill	has the meaning defined in Landfill Waste Classification and Waste Definitions 1996 published by DEC and as amended from time to time
controlled waste	has the definition in Environmental Protection (Controlled Waste) Regulations 2004
department; DWER	means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
discharge	has the same meaning given to that term under the EP Act.
emission	has the same meaning given to that term under the EP Act.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and equipment has been constructed and installed in accordance with the licence
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
GCL	means a geosynthetic clay liner made of two layers of woven fabric like material with bentonite clay in the middle
HDPE	means High Density Polyethylene
Inert Waste Type 1 and Type 2	has the meaning defined in Landfill Waste Classification and Waste Definitions 1996 published by the CEO and as amended from time to time
licence	refers to this document, which evidences the grant of a licence by the CEO under section 57 of the EP Act, subject to the specified conditions contained within.
licence holder	refers to the occupier of the premises, being the person specified on the front of the licence as the person to whom this licence has been granted.
NATA	means the National Association of Testing Authorities, Australia
NATA accredited	means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis
normal operating conditions	means any operation of a particular process (including abatement equipment) excluding start-up, shut-down and upset conditions, in relation to stack sampling or monitoring

Term	Definition
Oxalate	means sodium oxalate cake, a mix of caustic liquor and sodium oxalate derived from the refinery process
PM	means total particulate matter including both solid fragments of material and minuscule droplets of liquid
PM10	means particles with an aerodynamic diameter of less or equal to 10 µm
premises	refers to the premises to which this licence applies, as specified at the front of this licence and as shown on the premises map (Figure 1) in Schedule 1 to this licence.
prescribed premises	has the same meaning given to that term under the EP Act.
Putrescible Waste	means the organic component of the waste stream which can be decomposed by microbial action and become putrid and likely to cause obnoxious odours and attract (scavenging) birds or animals; putrescible waste includes food wastes or wastes of animal or vegetable origin
PVC	means Polyvinyl Chloride
quarterly	means the 4 inclusive periods from 1 April to 30 June, 1 July to 30 September, 1 October to 31 December and in the following year, 1 January to 31 March
quarter	means a three-month period of the year from 1 January to 31 March, 1 April to 30 June, 1 July to 30 September or 1 October to 31 December
Schedule 1	means Schedule 1 of this Licence unless otherwise stated
Schedule 2	means Schedule 2 of this Licence unless otherwise stated
SEP, SEP2, SEP3 and SEP4	means solar evaporation pond 1, solar evaporation pond 2, solar evaporation pond 3 and solar evaporation pond 4 as shown in Schedule 1: Map of premises and containment infrastructure
shut-down	means the period when plant or equipment is brought from normal operating conditions to inactivity
stack test	means a discrete set of samples taken over a representative period at normal operating conditions
start-up	means the period when plant or equipment is brought from inactivity to normal operating conditions
STP dry	means standard temperature and pressure (0oCelsius and 101.325 kilopascals respectively), dry
USEPA	means United States (of America) Environmental Protection Agency
USEPA Method 5	means the promulgated Test Method 5 - Determination of Particulate Matter Emissions from Stationary Sources
USEPA Method 7E	means the promulgated Test Method 7E – Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer

Term	Definition
	Procedure)
USEPA Method 10	means the promulgated Test Method 10 – Determination of Carbon Monoxide Emissions from Stationary Sources
USEPA Method 18	means the promulgated Test Method 18 – Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
USEPA Method 26	means the promulgated Test Method 26 – Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources, Non-Isokinetic Method
USEPA Method 26A	means the promulgated Test Method 26A – Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources, Isokinetic Method
USEPA Method 29	means the promulgated Test Method 29 – Determination of Metals Emissions from Stationary Sources
USEPA Method 201A	means the promulgated Test Method 201A – Determination of PM10 Emissions (Constant Sampling Rate Procedure)
USEPA SW846 Method 0011	means the promulgated Test Method SW-846/ 0011 – Sampling for Selected Aldehyde and Ketone Emissions from Stationary Sources
usual working day	means 0800 – 1700 hours, Monday to Friday excluding public holidays in Western Australia
waste	has the same meaning given to that term under the EP Act.

END OF CONDITIONS

Schedule 1: Maps

The boundary of the prescribed premises is shown in the map below (Figure 1).

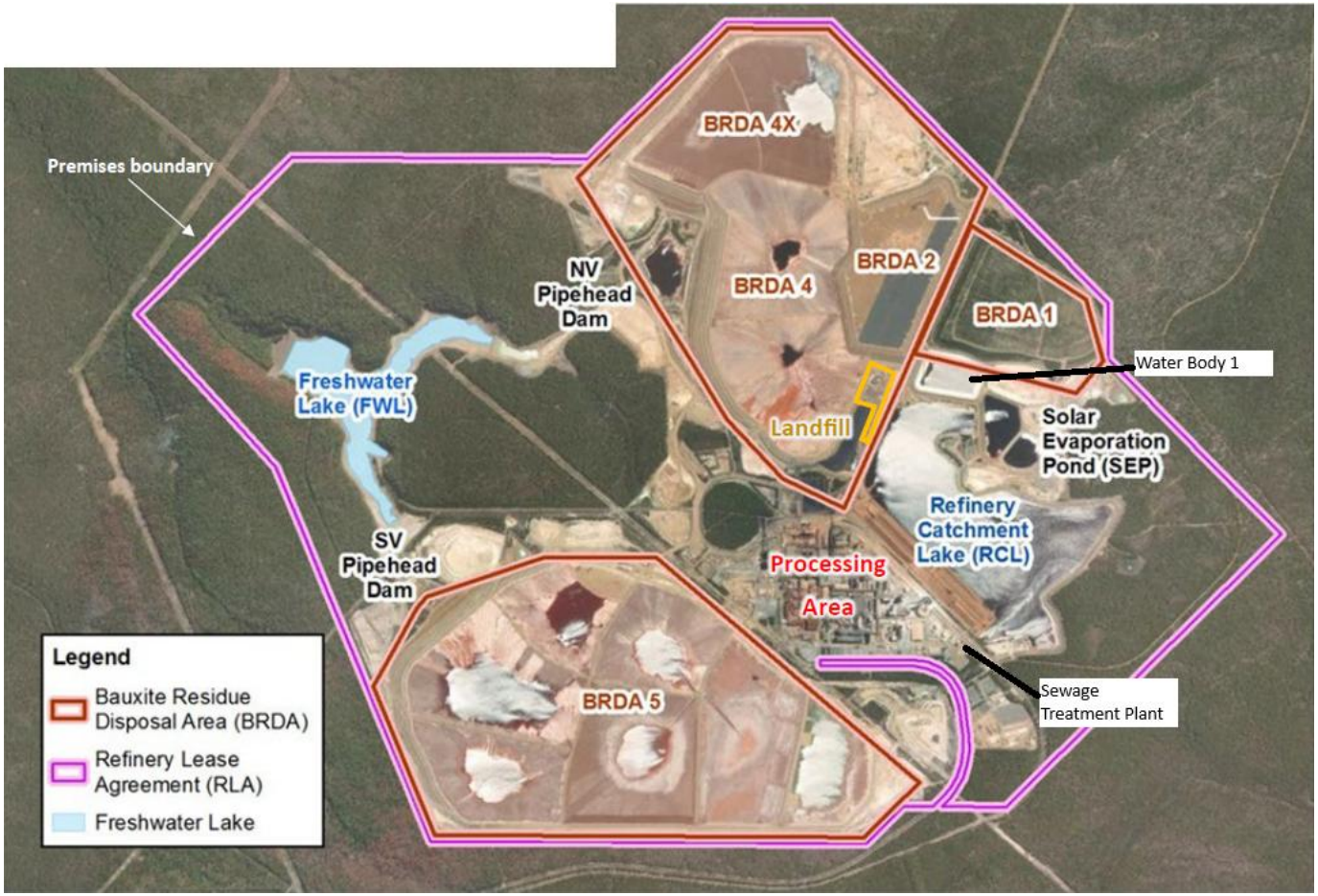

Figure 1: Map of the boundary of the prescribed premises and containment infrastructure

L4504/1981/17

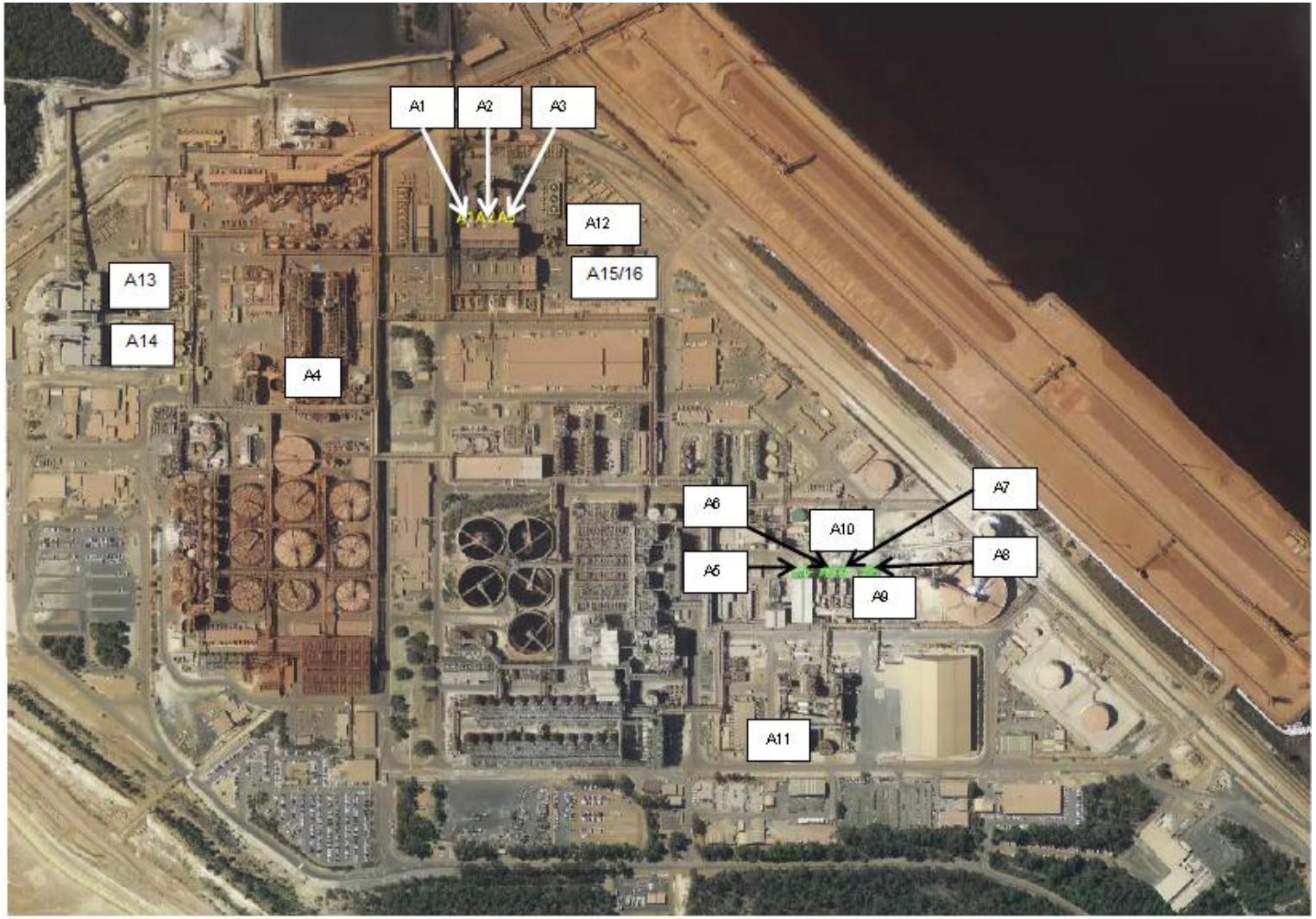

Figure 2: Map of emission points (emissions to air)

L4504/1981/17

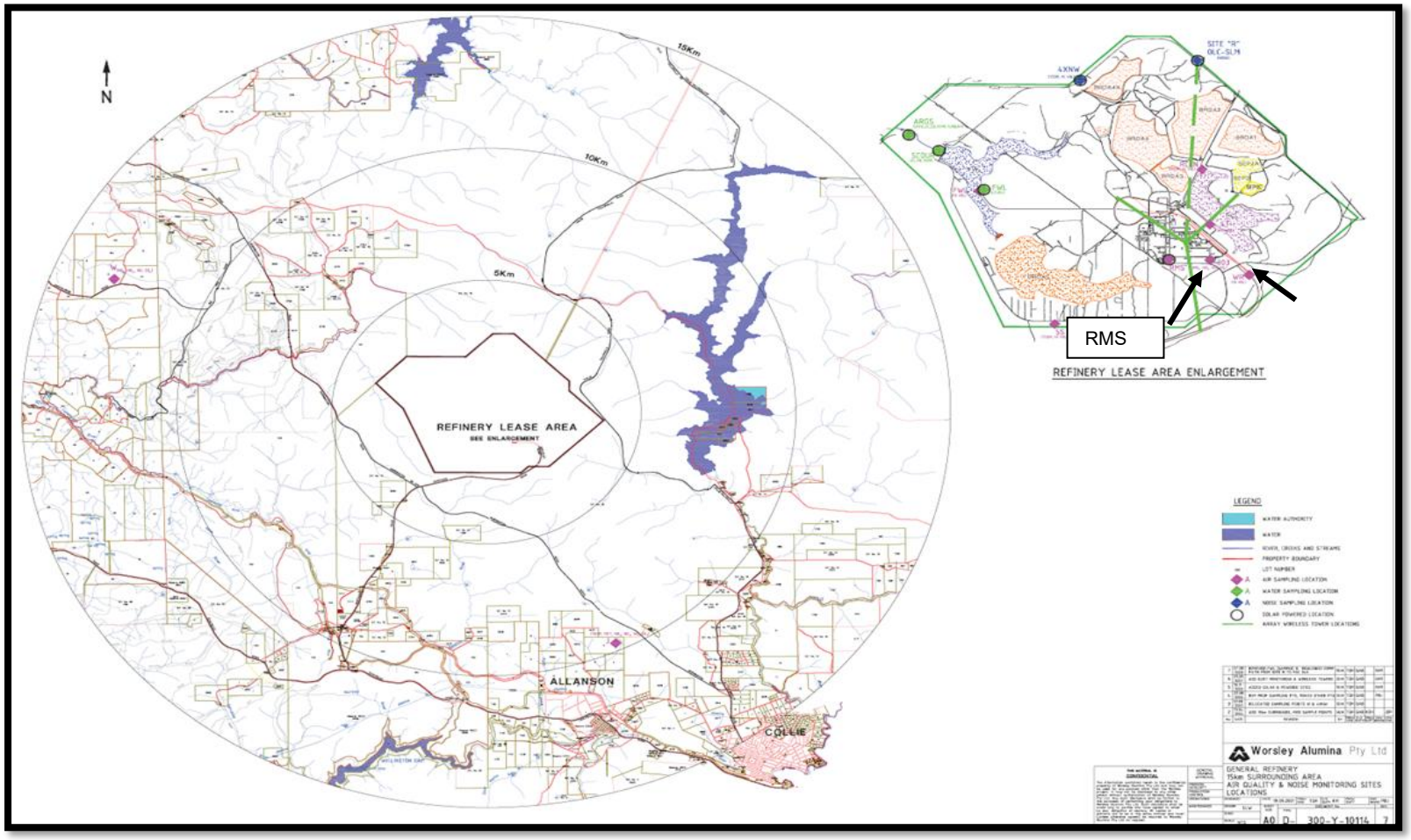

Figure 3: Map of ambient air emission monitoring sites

L4504/1981/17

Figure 4: Location of Water Body 1 and SEPS

L4504/1981/17

Schedule 2: Notification & forms

Licence: L4504/1981/17 Licence holder: South32 Worsley Alumina Pty Ltd

Form: RATA1 Period:

Name: Monitoring of CEMS Performance

Form AR2: RATA							
Emission point	**Parameter**	**Reference Method**	**Run**	**Sample date & times**	**Reference Result**	**CEMS Result**	**Unit**
A12	Carbon Monoxide	USEPA Method 10	1				
			2				
			3				
			4				
			5				
			6				
			7				
			8				
			9				
			10				
			11				
			12				
Relative Accuracy							%
Bias							%

Signed on behalf of South32 Worsley Alumina Pty Ltd: ……..

Date: ……..

Forms: ET1

Licence: L4504/1981/17 Licensee: South32 Worsley Alumina Pty Ltd

Form: ET1 Period:

Name: Target exceedances

Form ET1: Target exceedances
Please provide an analysis of the target exceedances for the quarter, including but not limited to: (a) the emission point (b) the date and time of the exceedance and period over which the exceedance occurred (c) the root cause analysis for the exceedances; (d) any common or contributory factors including but not limited to fuel, mass emissions, gas flow rates, inlet & exit temperature, abatement status; (e) a description of remedial measures taken or planned to be taken, including those taken to prevent recurrence of the exceedances; (f) complaints received that may have been caused by this exceedance; and (g) for those exceedances that may have caused complaints, meteorological details: temperature, wind speed and wind direction, humidity.

Signed on behalf of South32 Worsley Alumina Pty Ltd: ……..

Date: ……