

Wagerup Alumina Refinery – Production to a Maximum
Capacity of 4.7 Million Tonnes Per Annum and Associated
Bauxite Mining Ministerial Statements 728 and 1069 Request
for Section 46 Review of Conditions

Consultation Addendum

June 2020

Version 4

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Revision Table

Version	Changes	Date
1	First Issue with Appendix 1	December 2019
2	Inclusion of Appendix 2	January 2020
2.1	Amendments to Appendix 2 due to request for HRA	February 2020
3	Update to Appendix 1 Kwinana Peel Region (KPR) responses	February 2020
4	Final version incorporating changes on consultation with EPA	June 2020

1. Introduction

Developing and maintaining strong, mutually beneficial relationships with our stakeholders, including in the communities where we operate, is fundamental to Alcoa's business model. We believe it is important to have transparent and regular dialogue with identified stakeholders to ensure a mutual understanding of issues, concerns and opportunities. A Stakeholder Engagement Framework guides Alcoa locations globally in their engagement activities, including consultation for ongoing operations and projects.

Wagerup Alumina Refinery (Wagerup refinery) undertakes stakeholder engagement via a range of different channels and forums including:

- **Stakeholder briefings** – with local, state and federal government representatives occur on a regular basis. The meetings are an opportunity for Alcoa to update on business developments and for questions and concerns to be raised with the company.
- **Wagerup Community Consultative Network (CCN)** – this forum for two-way discussion with interested parties typically occurs every two months. The forum is open to any members of the local community and is regularly attended by neighbours and representatives from the Shires of Waroona and Harvey and South West Development Commission. Summary notes of CCN meetings are published in the Harvey Waroona Reporter (HWR).
- **Advertorials** – published in the HWR on a bi-monthly basis provide regular information flow to the broader community about activities at the refinery and Alcoa more broadly.
- **Employee and contractor communications** – occur via a variety of different channels including townhall meetings, newsletter articles and briefings.

2. Section 46 Review of Conditions consultation approach

Consultation regarding the Section 46 Review of Conditions (S46 Review) has utilised Alcoa's existing stakeholder engagement channels, with discussions with relevant parties about the potential refinery upgrade commencing in June 2018. Engagement occurred in two key phases with the objectives as outlined below:

Phase 1 – development of the S46 Review document

Objectives –

Build awareness and understanding of:

- Alcoa's evaluation of a potential upgrade project at the Wagerup refinery; and
- Alcoa's request for a S46 Review of conditions.

Phase 2 – post submission of the S46 Review document

Objectives –

- Continue to build understanding and awareness of the potential upgrade project;
- Build awareness and understanding of the Ministerial Condition changes requested by Alcoa and why;
- Reassure stakeholders that safeguards would be in place to ensure environmental factors were appropriately managed; and
- Develop understanding of subsequent process and assessment steps including:
 - Independent peer review of the proposed upgrade design
 - Works Approval application including 21-day consultation period administered by the Department of Water and Environmental Regulation
 - Investment decision by Alcoa.

The consultation approach recognised the elaborate consultation program undertaken as part of the Environmental Review and Management Plan (ERMP) development in 2005 which ultimately led to an environmental approval to produce 4.7 million tonnes per annum (Mtpa) via Ministerial Statement 728.

Over 12 months five community working groups met to participate in the identification, assessment and potential management of environmental factors associated with the proposal. A broader range of stakeholders were also involved through regular communications, such as newsletters, press articles, a designated website and a public open day during the preparation of the ERMP. Further information about this process is available at <https://www.alcoa.com/australia/en/sustainability/wagerup-unit-three-project-erm.asp>

3. Stakeholders

The following stakeholders have been engaged about the project and S46 Review process.

Stakeholders	
Local government	<ul style="list-style-type: none"> • Shire of Waroona • Shire of Harvey • City of Bunbury • Shire of Murray • City of Mandurah
Refinery neighbours	<ul style="list-style-type: none"> • Area A landowners
State Government	<ul style="list-style-type: none"> • Robyn Clarke MLA • Diane Evers MLC • Steve Thomas MLC • Adele Farina MLC • Colin Tincknell MLC • Don Punch MLA • Colin Holt MLC
Federal Government	<ul style="list-style-type: none"> • Nola Marino MP • Andrew Hastie MP
State Government departments	<ul style="list-style-type: none"> • Department of Water and Environmental Regulation (DWER) • Department of Jobs, Tourism, Science and Innovation (JTSI) • South West Development Commission • Peel Development Commission
CCN participants	<ul style="list-style-type: none"> • Local community members • Local and state government representatives
Local community members	<ul style="list-style-type: none"> • Residents of Waroona, Hamel, Yarloop, Cookernup, Harvey
Wider community members	<ul style="list-style-type: none"> • Residents of communities the Southwest region
Employees	<ul style="list-style-type: none"> • Wagerup refinery employees and contractors • Other Alcoa employees
Other	<ul style="list-style-type: none"> • Leschenault Catchment Council • Peel Regional Leaders Forum • Community Alliance for Positive Solutions (CAPS) • Bunbury Geographe Economic Alliance

4. Communication activity and channels

A broad range of stakeholder communication activities was deployed to engage and inform the community about the proposed project.

Activity	Date	Stakeholder Audience	Description
CCN briefings	24/08/2018	CCN participants	<p>Updates about Alcoa's evaluation of the potential upgrade project and the S46 Review have been provided at every CCN meeting since the August 2018.</p> <p>Greater detail has progressively been shared as it has become available, particularly during meetings in September and November 2019.</p>
	26/10/2018		
	14/12/2018		
	21/02/2019		
	12/04/2019		
	21/06/2019		
	19/08/2019		
	28/09/2019		
	08/11/2019		
13/12/2019			
Direct mail	19/09/2019	Neighbours (Area A) Government stakeholders Other stakeholders	<p>Two letters were sent to stakeholders advising:</p> <ol style="list-style-type: none"> 1. Alcoa had requested a S46 review of conditions. 2. Alcoa's submission to the EPA was available on the website for input. <p>The letters provided information about how to obtain additional information including by attending CCN meetings.</p>
	18/10/2019		
Advertising	23/10/2018	Waroona, Hamel, Yarloop, Cookernup, Harvey residents	<p>Details of discussions about the potential Wagerup Upgrade and S46 process were published in the HWR as part of CCN meeting minutes.</p>
	11/12/2018		
	18/02/2019		
	09/04/2019		
	16/06/2019		
	20/08/2019		
	24/09/2019		
	05/11/2019		
	10/12/2019		
Advertising	31/10/2019	Waroona, Hamel, Yarloop, Cookernup, Harvey residents Southwest region residents	<p>Advertorials were published in the HWR and South West Times providing an overview of the proposed upgrade project, an invitation to CCN and post meeting drop-in session.</p>
	29/10/2019		
	05/11/2019		

Activity	Date	Stakeholder Audience	Description
Social media	23/09/2019	Waroona, Hamel, Yarloop, Cookernup, Harvey residents	Agendas and invitations for the September and November CCN meetings, and the drop-in session were posted on the Waroona and Yarloop Community Resource Centre Facebook pages.
	25/09/2019		
	04/11/2019		
	04/11/2019		
	05/11/2019		
	10/12/2019		
Business updates	Various dates across 2018 and 2019	Shires of Harvey and Waroona Peel Regional Leaders Forum City of Mandurah JTSI State and Federal government stakeholders Bunbury Geographe Economic Alliance	Alcoa has taken the opportunity to update stakeholders on its evaluation of the potential Wagerup Upgrade during general business updates and meetings.
Detailed briefings	17/09/2019	Shire of Waroona	Detailed briefings were offered to key stakeholders following submission of the proposed condition changes to the EPA. During these sessions, Alcoa provided information about the proposed condition changes, the scope of the potential upgrade and next steps in the process.
	22/10/2019	Shire of Harvey	
	06/11/2019	JTSI	
	29/11/2019	Di Evers MLC	
	17/12/2019	Colin Holt MLC	
Technical briefings and update	28/06/2018	EPA Services	Alcoa maintained strong contact with the EPA and relevant branches of the DWER during the preparation of the S46 document and subsequent to its submission. Key topics of discussions during meetings and a site visit to Wagerup refinery have included: <ul style="list-style-type: none"> • S46 document review • 2018 Emissions Inventory • OP-FTIR technology • Odour Guidelines • Air Quality Model • Part V Works Approval
	27/07/2018	DWER – Air Quality, Noise, Process Industries,	
	30/08/2018	Air Services and Policy branches	
	06/11/2018		
	18/12/2018		
	14/01/2019		
	02/07/2019		
	09/07/2019		
	26/08/2019		
	07/10/2019		
25/10/2019 (Wagerup)			

Activity	Date	Stakeholder Audience	Description
	site visit) 04/11/2019 15/11/2019		
Drop-in session	08/11/2019	CCN attendees Wider community members	Alcoa hosted a drop-in style information session at the Yarloop Community Resource Centre. Members of the Alcoa team were available to describe the proposed project and ministerial statement condition changes, and answer questions. Information was displayed on boards around the room and a hardcopy handout or thumb drive copy of all S46 documents was also available.
Website	18/10/2019	All identified stakeholders General public	<p>The following documents were posted on Alcoa's website at www.alcoa.com/australia/wagerup-S46:</p> <ul style="list-style-type: none"> • Wagerup Refinery Summary Overview of s.46 Supporting Document • Wagerup Alumina Refinery Request for Section 46 Review of Conditions October 2019 • Appendix 1 – 2018 Wagerup Refinery Emission Inventory • Appendix 2 - Estimation of Volatile Organic compound Emissions from 45K Cooling Towers at Wagerup Refinery • Appendix 3 - Overview Design Report Supporting Ministerial Statement 728 Section 46 Application

5. Feedback from Alcoa initiated consultation

The following is a summary of the feedback and questions received by Alcoa during the community consultation, along with the company's response.

Table 1 Key questions asked

Topic	Questions and comments	Response
Residue storage	Will there be a requirement for additional residue storage areas?	Future residue storage requirements are not within the scope of the S46 review process.
	Will there be an increase in residue storage area height?	The current Long-Term Residue Management Strategy (LTRMS) commits to a maximum residue storage area (RSA) height of 60 metres above average natural ground level. There are no current plans to amend this. Any proposal to change the maximum height of the RSAs would involve consultation through the LTRMS Stakeholder Reference Group.
Land management	Will the Wagerup Area A land management boundary be changed?	There are no plans to change any elements of the Wagerup Land Management Plan including the Area A boundary.
	How many properties does Alcoa own in Area B Yarloop? I hear very few?	Alcoa owns less than 10 properties in Area B Yarloop (less than 5% of property in Yarloop Area B). Alcoa will sell these in due course.
Air quality	Will there be a reduction in air quality and impact on local community as a result of the growth project?	The proposed project is being designed to ensure there is no overall increase in VOC and odour emissions at the Wagerup refinery.
	Will emissions (VOC) increase as a result of this project?	
Noise impacts	Will there be an increase in noise from the extra production?	Alcoa has committed to no increase in noise from the refinery boundary as a result of the upgrade project.
Additional mining	Will there be a need to increase mining?	Any increase in refinery output will require a increase in bauxite supply and therefore mining.
	Potential impact of the Willowdale Mine Larego crusher move on recreational activities in the area?	Willowdale mine will continue to supply the Wagerup refinery. Mining is planned to move to the new Larego mine region in 2021 (south of the current mining operation). Access to areas adjacent to mining operations need to be managed to ensure public safety. As a result, there may be

		some constraints on access to recreational areas however Alcoa will seek to minimise these.
Bauxite exports	Will this mean the bauxite previously exported will now be processed?	Alcoa has approval to export up to 2.5 million tonnes per annum of bauxite until 2021. Any export beyond this time will require further approval. There were limited export shipments of bauxite from the Willowdale mine in 2018. Bauxite from Huntly mine is now supplied for export.
Further consultation	Will ongoing consultation continue as the project progresses?	Updates will continue to be provided to the CCN, and where relevant using advertorials and other methods. The Part V Works Approval application process administered by the DWER will provide an additional opportunity for formal public comment.
3.3Mtpa v 4.7Mtpa	Do you have the technology today to manage VOC emissions if you decide you want to grow production beyond 3.3Mtpa to 4.7Mtpa?	We will be required to undertake further work to develop the technology/emissions control techniques for any future growth to 4.7Mtpa. This would be approved under a Part V Works Approval application. Alcoa is not currently considering an increase in production to 4.7Mtpa.

6. Feedback from EPA initiated consultation

EPA initiated consultation with relevant regulatory departments. Submissions made to the EPA were made available to Alcoa and **Appendix 1** provides Alcoa's responses.

Further feedback was received via the EPA in December 2019 from the Air Quality Services Branch and CAPS. **Appendix 2** provides Alcoa's responses.

In addition, the EPA received a letter from the Hon. Diane Evers MLC, dated 22 November 2019. The letter was made available to Alcoa in mid-December 2019. Alcoa met with Ms Evers on 29 November 2019 to provide information on the proposed Wagerup Efficiency Upgrade Project and amendments requested via the S46 Review. During this meeting, Alcoa representatives responded to a number of questions which were similar in context to the issues raised in her submission to the EPA.

7. Further stakeholder engagement activity

Alcoa sincerely thanks those people who have participated in consultation activities to date, including through submissions to the Environmental Protection Authority (EPA).

Alcoa will continue to engage stakeholders on the section S46 process through existing stakeholder engagement channels.

Appendix 1 Response to submissions provided to EPA

Submitter	Submission and/or issue	Response to Comment
Air Quality		
Process Industries Branch (PIB)	<p>PIB views the s46 process and flow on outcomes as an important input to the review of Alcoa’s licence L6217/1983/15 and providing greater accuracy and certainty of the Wagerup Refinery air emissions.</p>	<ul style="list-style-type: none"> • Noted
<u>Condition 8</u>	<p>PIB supports the concept of a Detailed Design Report (DDA) subject to independent peer review as part of any works approval application. This process is expected to add an additional layer of rigour and certainty to information Alcoa ultimately provides in a future works approval application.</p> <p>It is expected that the independent peer review process can provide confidence that the DDA is in fact presented in a works approval on the basis of accurate and reliable base emission rates with best practice emissions control measures to achieve design emission targets. PIB is of the view that, the independent peer review is more important on the basis of proposed deletion of specified emission rate reductions from listed sources. Community groups such as the Community Alliance for Positive Solutions Inc (CAPS) have long demanded (e.g. appeals, application submissions and Ministerial/CEO correspondence) the implementation of independent auditing, certification and review mechanisms for a range of regulatory issues concerning Wagerup due to mistrust of government and Alcoa. It is expected the independent peer review step would be a step towards addressing those concerns.</p> <p>Based on the information above PIB does not support the proposed change to condition 8-4, that a DDA is subject to independent peer review only if required by the CEO.</p>	<ul style="list-style-type: none"> • Alcoa agrees that subjecting the Detailed Design Reports required by conditions 8-1 and 8-1A to independent peer review will add extra rigour and increase confidence that expansion works will meet design emission targets. • However, there may be expansions for the refinery in the future which do not entail significant works or large increases in production or impact on emissions and therefore may not be of a sufficient scale or impact to require independent review. • Alcoa consider that the CEO should have discretion as to when independent review is required, as proposed in amended condition 8-4.
	<p>The DDA’s are based upon detailing best practice pollution control measures to minimise emissions from expansion works and this does not clearly align with the</p>	<ul style="list-style-type: none"> • Alcoa supports the need for alignment between the Part IV conditions and Part V processes and recognises the potential for differences of

Submitter	Submission and/or issue	Response to Comment
	<p>risk-based assessment central to DWER's Part V of the EP Act Regulatory Framework.</p>	<p>interpretation associated with terminology such as 'best practices pollution control measures' and 'risk-based assessment frameworks'.</p> <ul style="list-style-type: none"> • To address this as much as possible Alcoa has proposed a definition for best practice in condition 8 as follows: <i>'Best practice pollution control measures include technology, practices and equipment which are:</i> <ul style="list-style-type: none"> • <i>proven reliable in full-scale operation and applied in similar applications to achieve lower emissions; and</i> • <i>reasonable and practicable given the level of emissions and risk of health and/or amenity impacts from the emissions.</i> • This definition recognises risk of health and amenity impacts as a fundamental consideration in the evaluation of best practice pollution control measures. • The potential for misalignment of condition 8 and the Part V process might be further reduced by replacing the word 'minimise' with 'manage' in the wording of conditions 8-1 and 8-1A which states <i>'best practice pollution control measures employed to minimise emissions from the Refinery'</i>.
	<p>Base emissions rates for production increases up to 3.3 Mtpa will be based on the Inventory Report. The Inventory Report incorporates some data improvements including increased understanding of 45K Cooling Tower VOC emissions and odour concentrations, however proposed further monitoring will not be completed for at least two years. While PIB can potentially address further monitoring objectives through its licence review and conditions of a licence, this will unlikely address the more immediate residual uncertainties in the emissions inventory for a works approval application for expansion to 3.3 Mtpa expected from Alcoa in early 2020.</p>	<ul style="list-style-type: none"> • Alcoa considers this a critical matter in respect of clarity and certainty of the approval process for the expansion of the refinery to 3.3 Mtpa, and hence the refinery expansion project schedule. • Existing condition 8 outlines that the Detailed Design Report for expansion works shall set out the "base emission rates" for the major sources for the refinery and the design emission targets for the expanded works design. The existing condition defines "base emission rates" as those determined from monitoring from July 2002 to March 2004. • Alcoa has proposed condition 8 be amended such that the "base emission rates" for expansion works to 3.3 Mtpa be based on the 2018 Emission Inventory which includes all monitoring data up to 2018. • If condition 8 is amended to reflect the 2018 Emission Inventory as the "base emission rates" but further refinery emissions monitoring is required as part of the Part V Works Approval process, this would present a significant inconsistency between the Part IV and Part V processes and pose significant risk for the project.

Submitter	Submission and/or issue	Response to Comment																																							
		<ul style="list-style-type: none"> For the reasons outlined below, Alcoa considers the 2018 Emissions Inventory provides a sound and robust emissions base for evaluation of any potential health and amenity impacts from expansion of the refinery to 3.3 Mtpa. <p>1. Substantial further monitoring has been carried out post the 2005 ERMP assessment and approval for the refinery expansion to increase certainty of refinery emissions</p> <p>MS 728 granted approval for expansion of the refinery to 4.7 Mtpa based on the assessment using base emission data from 2002 to 2004, with a condition (9-1) requiring “twelve additional months of base case emissions rate data for key sources” with key sources defined as the “liquor burner, calciners, 25A tank vents, 35A tanks, 35J tanks and cooling towers”. The Table below shows the extensive additional monitoring of these sources since the 2005 ERMP.</p> <table border="1" data-bbox="1252 719 1980 1445"> <thead> <tr> <th>Source</th> <th>No. sampling runs 2002 - 2004</th> <th>No sampling runs 2005 -2018</th> </tr> </thead> <tbody> <tr> <td>Liquor burner</td> <td>13</td> <td>67</td> </tr> <tr> <td>○ VOCs</td> <td></td> <td></td> </tr> <tr> <td>○ odour</td> <td>7</td> <td>67</td> </tr> <tr> <td>Calciners</td> <td>46</td> <td>261</td> </tr> <tr> <td>○ VOCs</td> <td></td> <td></td> </tr> <tr> <td>○ odour</td> <td>35</td> <td>264</td> </tr> <tr> <td>25A Tanks</td> <td>5</td> <td>46</td> </tr> <tr> <td>○ VOCs</td> <td></td> <td></td> </tr> <tr> <td>○ odour</td> <td>5</td> <td>46</td> </tr> <tr> <td>35A Tanks</td> <td>3</td> <td>29</td> </tr> <tr> <td>○ VOCs</td> <td></td> <td></td> </tr> <tr> <td>○ odour</td> <td>0</td> <td>28</td> </tr> </tbody> </table>	Source	No. sampling runs 2002 - 2004	No sampling runs 2005 -2018	Liquor burner	13	67	○ VOCs			○ odour	7	67	Calciners	46	261	○ VOCs			○ odour	35	264	25A Tanks	5	46	○ VOCs			○ odour	5	46	35A Tanks	3	29	○ VOCs			○ odour	0	28
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Submitter	Submission and/or issue	Response to Comment			
		35J Tanks	3	70	
		○ VOCs	0	64	
		○ odour			
		Cooling towers	24	20	
		○ VOCs	3	8	
		○ odour			
		<p>Alcoa recognised that emission estimates for the 45K Cooling Towers presented the greatest uncertainty due to the practical difficulties of sampling the emissions. As part of the Section 46 process, Alcoa therefore undertook a mass balance approach for the 45K cooling tower emissions, which has provided greater certainty.</p>			
		<p>The 2018 Emissions Inventory provides a substantial basis for setting base emission rates for the refinery and the design emission targets for the expansion works to 3.3 Mtpa. The extent of emissions data in the inventory is significantly beyond that which would normally be collected to characterise and quantify emissions from an industrial facility.</p>			
		<p>2. The expansion to 3.3 Mtpa will result in a reduction in VOC emissions and effectively no increase in odour.</p>			
		<p>As shown in Table 2 of Appendix 3 of the Section 46 Document, there will be an overall reduction in VOC emissions and effectively no increase in odour from the refinery through the capture and destruction of emissions from the Slurry Storage (25A) Tanks as part of the expansion works.</p>			
		<p>As also shown in Table 2 of Appendix 3 of the Section 46 Document and summarised below, there will be only small increases in a limited number of refinery sources as part of the expansion works.</p>			

Submitter	Submission and/or issue	Response to Comment	
		Source	Estimated increase in total refinery emissions from expansion
		Calciners	VOC +6% Odour +6%
		Cooling towers	VOC +2% Odour +4%
		Milling	VOC +2% Odour 0%
		Seed filtration	VOC +2% Odour +1%
		Sand separation	VOC +1% Odour +3%
		Powerhouse	VOC +1% Odour +1%
		Slurry storage (25A)	VOC -16% Odour -12%
		<p>The greatest increase in VOC emissions will be from the Calciners. As indicated above, there has been substantial monitoring of Calciner emissions so there is considerable certainty regarding emission estimates from this source.</p>	
		<p>The greatest increase in odour will also be from the Calciners. However, as shown in Figure 4 of the Section 46 Document, current peak odour rates from the Calciners are less than half than they were in 2005 for the ERMP</p>	

Submitter	Submission and/or issue	Response to Comment
		<p>assessment. Even with the small increase from the expansion to 3.3 Mtpa, they will be still be substantially below previous levels.</p> <p>Emission increases from other sources are estimated to be small. Condition 10 requires an Air Quality Verification Plan to confirm design emission targets are met.</p> <p>3. There will be no new processes as part of the expansion works.</p> <p>There will be no new bauxite refining processes as part of the expansion works which could generate different emissions. The Bayer process used at the Wagerup refinery is essentially the same as that used at most alumina refineries and emissions from the Wagerup refinery are typical of other alumina refineries.</p> <p>There will be a new Calciner (No. 5) and new RTO for the Slurry Storage (25A) Tanks. These adopt proven technologies operating in Alcoa operations in Western Australia currently.</p> <p>4. Substantial ambient air quality monitoring post the ERMP assessment and approval of the refinery expansion.</p> <p>A key issue at the time of the ERMP assessment was that there had been only limited ambient air quality monitoring in the locality of the Wagerup refinery, particularly for VOCs.</p> <p>Two intense ambient air quality monitoring programs were carried out in winter 2006 and winter 2009, including substantial VOC monitoring.</p> <p>The monitoring programs have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. There are some short-term elevations in the concentration of some compounds including NOx and acetone that are attributable to the Wagerup refinery, however, the concentrations measured during these events are low and substantially below levels which would normally cause odour nuisance. For example, the maximum concentration of acetone recorded during the studies was 10 parts per billion (ppb) compared to a health Effects Screen Level of 2,500 ppb (DER 2009). The maximum one-hour NO₂ level recorded was around 20 ppb compared to the NEPM health standard of 120 ppb (DER, 2009).</p>

Submitter	Submission and/or issue	Response to Comment
		<p>5. A conservative approach is adopted in the Health Risk Assessment (HRA) of refinery emissions</p> <p>The conservative approaches in the air quality modelling to predict ground level concentrations of pollutants has been applied in previous HRAs for the refinery. These conservative approaches are outlined at pages 34 and 35 of the Section 46 document.</p> <p>An HRA was undertaken for the refinery, at the proposed 4.7Mtpa, which showed that, even with the conservative approaches adopted, refinery emissions are well below levels that would cause any:</p> <ul style="list-style-type: none"> ○ Acute health effects; ○ Chronic health effects; ○ Increased cancer risk. <p>6. Alcoa has implemented a substantial land purchase program to allow any people who have concerns regarding emissions from expansion of the refinery to leave the area.</p> <p>As agreed with Government as part of the approval to allow expansion of the refinery up to 4.7 Mtpa, Alcoa has implemented a substantial land purchase program to allow any people who have concerns regarding emissions from expansion of the refinery to leave the area. More than 600 properties covering an extensive area as shown in Figure 1 of the Section 46 Document have been purchased by Alcoa under the Land Management Plan and Supplementary Property Purchase Program.</p> <p>Alcoa is currently only proposing to expand the refinery to 3.3 Mtpa. Increasing the refinery production in increments will provide benefits in enabling emissions reductions to be monitored and verified in steps as production increases, rather than in one large single-stage expansion to 4.7 Mtpa.</p> <p>7. Low number of complaints concerning health symptoms associated with the refinery.</p> <p>As shown in Table 1 of the Section 46 Document, there has been a pronounced reduction in complaints related to health symptoms from the refinery since the ERMP assessment and approval of the refinery expansion.</p>

Submitter	Submission and/or issue	Response to Comment										
		<p>The low number for recent years are shown in the Table below.</p> <table border="1" data-bbox="1167 245 1917 432"> <thead> <tr> <th data-bbox="1167 245 1375 304"></th> <th data-bbox="1379 245 1518 304">2015</th> <th data-bbox="1523 245 1650 304">2016</th> <th data-bbox="1655 245 1783 304">2017</th> <th data-bbox="1787 245 1917 304">2018</th> </tr> </thead> <tbody> <tr> <td data-bbox="1167 308 1375 432">Total no. health complaints</td> <td data-bbox="1379 308 1518 432">1</td> <td data-bbox="1523 308 1650 432">2</td> <td data-bbox="1655 308 1783 432">0</td> <td data-bbox="1787 308 1917 432">0</td> </tr> </tbody> </table>		2015	2016	2017	2018	Total no. health complaints	1	2	0	0
	2015	2016	2017	2018								
Total no. health complaints	1	2	0	0								
	<p>PIB notes part (i) and part (ii) of condition 8-5, particularly wording such as “where possible” and “significantly” which are difficult to define and allow for subjectivity and uncertainty. PIB notes that such wording is often the subject of community frustration, who believe that it allows Alcoa to engage in “production creep” without triggering the boarder Wagerup Unit 3 Expansion proposal requirements of MS 728 and 1069. PIB suggests the EPA consider amending or providing definition to this ambiguous wording within condition 8-5 to provide clarity under Part V of the EP Act, and for members of the public. The comments above also extend to the same condition wording used in condition 9-4 and 10-7.</p>	<ul style="list-style-type: none"> Alcoa considers that the wording of conditions 8-5, 9-4 and 10-7 places appropriate controls on the extent of individual works which may be allowed to proceed without meeting the full requirements of all conditions. The wording does not provide the CEO unfettered discretion in permitting expansion works. The term “significant” is used commonly in the EP Act and other legislation. The term “where possible” may be better worded as “where practicable” as practicable is defined in the EP Act 										
	<p>Page 14 – “Alcoa has implemented a substantial Land Management Program for the Wagerup Refinery to enable any people who have concerns regarding emissions from the refinery to relocate away from the area.”</p> <p>Clarify whether this is referring to the previous Supplementary Property Purchase Scheme administered by the W.A Government, and if so what types of emissions from the refinery were considered.</p>	<ul style="list-style-type: none"> As set out on page 12 of the Section 46 Document, property purchases have occurred under both the Land Management Plan (properties in Areas A and B) and also the State Government administered Supplementary Property Purchase Program which enabled any property owners outside of the Land Management Plan areas to also sell their properties if they had concerns regarding the existing refinery operations or future expansion. This was in line with the EPA’s recommendation following assessment of the proposed expansion. All landowners had the right to participate in the Supplementary Property Purchase Program if they had any concerns regarding any emissions from expansion of the refinery up to 4.7 Mtpa. 										
	<p>Page 20 – ‘Work Planned to Further Validate Emissions’. Further discussion is required around the timing, scope and mechanism for implementation of the proposed program of further monitoring.</p>	<ul style="list-style-type: none"> Alcoa agrees that it would be beneficial to consult with DWER to prepare a detailed Scope of Works and schedule for the work planned to further validate emissions. 										

Submitter	Submission and/or issue	Response to Comment
		<ul style="list-style-type: none"> As indicated above however, Alcoa considers the 2018 Emissions Inventory provides a sound and robust emissions base for evaluation of any potential health and amenity impacts from expansion of the refinery to 3.3 Mtpa and does not consider the further validation work needs to be completed as part of the approval process for expansion of the refinery to 3.3 Mtpa. The further emissions validation work is planned to be completed within the next two years as set out in Table 2 (page 20) of the Section 46 Document and will support any expansions beyond 3.3 Mtpa.
	<p>Page 22 – ‘Evaluation of VOC and odour emission abatement measures’.</p> <p>The evaluation (and future DDA) should also include justification of reducing 25A tank emissions on the basis of reduced receptor impacts.</p>	<ul style="list-style-type: none"> As set out on page 24 of the Section 46 Document, as part of the 2005 ERMP assessment, Alcoa undertook air quality modelling to assess the sensitivity of the predicted ground level odour concentrations to variations in odour emissions from the different refinery sources (Environ, 2005b). The modelling showed the Slurry Storage (25A) Tanks generally had a higher capacity to affect amenity at receptors than odour emissions from other sources. The Wagerup air quality model is currently being updated and this will support the Works Approval application to provide further justification of the reduced receptor impacts of capturing and destroying VOC and odour emissions from the Slurry Storage (25A) Tanks.
<u>Condition 9</u>	<p>DWER undertakes a risk-based assessment based on a source, pathway, receptor and potential impact methodology and while modelling is not the sole input into risk assessment, the absence of a satisfactory level of accuracy and reliability in air dispersion modelling has inhibited DWER’s ability to undertake meaningful risk assessment of air emissions.</p>	<ul style="list-style-type: none"> Alcoa strongly disagrees with the view that the Wagerup air quality model displays an “absence of a satisfactory level of accuracy and reliability” and inhibits an ability to “undertake meaningful risk assessment of air emissions”. Alcoa in consultation with the CSIRO and recognised competent air quality modelling consultants has undertaken extensive work on developing and verifying the Wagerup air quality model over some 15 years. The work has shown the model performs well for most dispersion pathways. The work has concluded that there is some uncertainty in model predictions for dispersion of near surface emissions from low level refinery sources during night and early morning hours in light wind, stable conditions (pathway 5). However, field monitoring has shown that concentrations of VOCs during these conditions are generally no higher than during other dispersion pathway conditions. Further, the field

Submitter	Submission and/or issue	Response to Comment
		<p>monitoring has shown pollutant concentrations are extremely low compared to health guidelines during these events.</p> <ul style="list-style-type: none"> • All models will have a degree of uncertainty and this of course should be taken into consideration in decision making. In the case Wagerup air model and HRA the following factors need also to be taken into consideration: <ol style="list-style-type: none"> 1. The conservative approaches adopted in the air modelling as outlined at pages 34 and 35 of the Section 46 Document; 2. The extensive ambient air quality monitoring undertaken in the locality which has shown concentrations of pollutants well below health guidelines consistent with the modelling; and 3. The health impact assessments of emissions from the Wagerup refinery have been well within what are considered acceptable levels, ie there is a considerable buffer between predicted ground level concentrations of pollutants and air quality health guidelines. • The extensive air quality model development and verification work and results of ambient air quality monitoring provide a very sound degree of confidence for assessment of any potential health impact from expansion of the Wagerup refinery.
	<p>There is a stated intent and requirement to compare predictions in an updated model with the 2005 ERMP predictions. While this may be a technical matter for AQS to address further, PIB is of the understanding that meaningful comparison may be limited, if not impossible for a number of reasons. This was the case for 2014 air dispersion modelling undertaken by Alcoa.</p>	<ul style="list-style-type: none"> • Condition 9-2 requires that information is provided on whether ground level concentrations (GLCs) predicted by the updated air quality model are consistent with those predicted in the ERMP assessment. • The predicted GLCs used in the ERMP were found to be acceptable in terms of potential health and amenity impacts. Alcoa understands the intent of condition 9-2 is to ensure that with improvements made in the model since the ERMP, predicted GLCs are similar, therefore confirming potential health and amenity impacts are still acceptable.
	<p>Page 33 – Alcoa’s air emissions impacts assessment / modelling should consider the ground level concentration values set out in the DWER’s <i>Draft Guideline on Air Emissions</i> (available here: https://www.der.wa.gov.au/our-</p>	<ul style="list-style-type: none"> • Alcoa notes DWER’s <i>Draft Guideline on Air Emissions</i> which is currently open for consultation to 17 January 2020.

Submitter	Submission and/or issue	Response to Comment
	work/consultation/open-consultation/552-draft-guideline-on-air-emissions).	<ul style="list-style-type: none"> Alcoa will have regard to the Guideline in preparing its Works Approval application and supporting documents for the refinery expansion to 3.3 Mtpa.
<u>Condition 10</u>	<p>DWER's recently published <i>Guideline: Industry Regulation Guide to Licensing</i> outlines a streamlined approach for condition setting to transition through construction, commissioning and time limited operational phases in a works approval, subject to conditions including submission of phase specific reports. This approach is subject to an applicant providing sufficient information on the risk of emissions during each phase to facilitate DWER risk assessment, especially the commissioning and operational phases.</p> <p>The proposed change in condition 10-1 provisions for submission of an Air Quality Verification Plan prior to commissioning rather than prior to submitting a works approval application. Consideration of an Air Quality Verification Plan is likely to be an important input to a works approval application risk assessment of commissioning and operational air emissions. The proposed change to condition 10-1 should be reconsidered unless Alcoa's intent is for the scope of any works approval application to be for the construction phase only.</p>	<ul style="list-style-type: none"> Alcoa notes the recently published <i>Guideline: Industry Regulation Guide to Licensing</i> and supports the intent of a streamlined approach for condition setting to transition through construction, commissioning and time limited operational phases in a works approval. However, in the case of the proposed Wagerup expansion it is expected construction will take some 18 months to complete and Alcoa considers it is more appropriate to finalise the Air Quality Verification Plan during that time, prior to commissioning. This will allow the plan to be based on the most appropriate standards and technologies at the time. In line with this Alcoa's preference remains that the AQVP be formally submitted prior to commissioning. However, Alcoa also recognises the benefits of presenting some information on how design emission targets will be verified as part of the Works Approval application for construction and will submit a draft preliminary AQMP as part of the application. This AQVP would then be finalised post consultation with key stakeholders and submitted as part of the Works Approval for commissioning.
	<p>Notwithstanding the above comments, Condition 10 is comprehensive and includes a requirement to implement the Air Quality Verification Plan (Condition 10-3). On the basis that the risk of air emissions during commissioning is regulated under Ministerial Statement conditions, there is a likelihood that DWER will not further risk assess or impose works approval conditions on this aspect.</p>	<ul style="list-style-type: none"> Noted.
	<p>PIB does not support the proposed changes to condition 10-2. The Air Quality Verification Plan should be subject to independent peer review to provide independent assessment of whether the performance verification monitoring is adequate and fit for purpose with</p>	<ul style="list-style-type: none"> Alcoa considers that DWER would have appropriate resources to review the Air Quality Verification Plan. However, if DWER considers that independent review is required, Alcoa agrees this can be undertaken.

Submitter	Submission and/or issue	Response to Comment
	management procedures for achieving design emission targets that are accepted as robust.	
Social Surroundings		
Environmental Noise Branch (ENB)	ENB notes that condition 11 of MS 728 and 1069 works in conjunction with the Alcoa's regulation 17 approval and is therefore not to be considered duplicative. ENB considers a change in wording of the condition 11 is more appropriate than its removal.	<ul style="list-style-type: none"> • Alcoa considers that noise from the Wagerup refinery can be appropriately regulated under Part V of the EP Act and the Noise Regulations, and that an EP Act Part IV condition presents duplication. • The proposal to expand Wagerup refinery from 2.4 Mtpa to 4.7 Mtpa was assessed at the level of Environmental Review and Management Programme (ERMP) under the ENVIRONMENTAL IMPACT ASSESSMENT (PART IV DIVISION 1) ADMINISTRATIVE PROCEDURES 2002. It was practice under these procedures to require Management Plans to be prepared as part of the ERMP process. In accordance with this Alcoa prepared a Noise Management Plan (NMP) (ERMP Section 10) and Noise Management Strategy Appendix I. • Condition 11 of MS 728 was set in 2006 requiring revision of the NMP to the requirements of the Minister for Environment, on the advice of the EPA, prior to Alcoa submitting a Works Approval for the expansion works. This was on the basis that expansion would occur in one increment from 2.4 Mtpa to 4.7 Mtpa. • Alcoa is now proposing to expand the refinery in smaller increments, with the initial increment from the current approved capacity of 2.85 Mtpa to 3.3 Mtpa. Since the original condition was set, Alcoa has also been granted a Regulation 17 approval relating to regulation of noise emissions from the refinery under the Noise Regulations. • All works to expand the refinery which may increase noise will require a Works Approval application under Part V of the EP Act. Section 54 (1)(c) of the Act provides that: <ul style="list-style-type: none"> <i>54. Works approvals, applying for, granting, refusing etc.</i> <i>(1) An application for a works approval shall be —</i> <i>(c) supported by such plans, specifications and other documents and information, including a summary thereof, as the CEO requires.</i> • The CEO therefore has broad powers under Part V of the Act to require whatever information is required to properly assess acceptability of noise

Submitter	Submission and/or issue	Response to Comment
		<p>emissions from any expansion works, including modelling and verification of noise emitting element or clusters of elements associated with the works.</p> <ul style="list-style-type: none"> Alcoa therefore considers any Part IV condition simply duplicates these powers and its preference remains that condition 11 be deleted.
	<p>ENB notes the EPA's assessment report no. 1215 (Report 1215) for the original MS 728, particularly that the proposal was capable of being managed so as to achieve no increase in noise from the baseline emissions from 2001. Alcoa is requested to demonstrate how the proposed works for 3.3 Mtpa can be achieved with no increase in noise from the baseline emissions from 2001.</p>	<ul style="list-style-type: none"> Alcoa considers that information on how noise will be managed for expansion of the refinery to 3.3 Mtpa should be provided as part of the Works Approval application. The information should: <ul style="list-style-type: none"> demonstrate that noise levels will not exceed the approved levels set out in the <i>Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012</i> (as amended); and evaluate any practicable measures to reduce noise levels to lower than these approved levels.
	<p>Noise monitoring has indicated the refinery has difficulty in complying with regulation 17 approval at residential locations to the North under certain meteorological conditions, particularly the hamlet of Hamel. Works proposed by Alcoa as part of the upgrade to 3.3 Mtpa (particularly from the bauxite milling area located in the North), have the potential to increase impacts to residents to the North. ENB requests that Alcoa demonstrates how it noise emissions to the North would improve as part of the proposed works.</p>	<ul style="list-style-type: none"> As above.
	<p>Alcoa should provide details of any reduction in noise levels that would be achieved as part of the upgrade to 3.3 Mtpa, particularly if the reduction has the potential be used as an offset for future upgrades up to the maximum capacity of 4.7 Mtpa.</p>	<ul style="list-style-type: none"> As above.
	<p>Alcoa is required to present noise modelling for before and after incremental upgrade scenarios, and validation of no increase and/or reduction by localised measurement is also required. If an increase in the noise output for a cluster is inevitable, details of additional works that will provide an offset to achieve the goal of no overall increase</p>	<ul style="list-style-type: none"> As above.

Submitter	Submission and/or issue	Response to Comment
	<p>in the noise output from the Refinery in total is required. This would then require modelling of the corresponding clusters or possibly of the entire Refinery. Verification will also be needed to be extended to the additional offset clusters.</p> <p>Alcoa is required to provide a comparison between noise emitted from the current operations and of the proposed operations. Sub conditions 1, 2 and 3 of condition 11-1 should be modified to include not only modelling and verification of the proposed works but also of the current operations. In the case of the proposed works indicating an increase in noise emissions, relevant modelling and verification of offset works to show no total increase from the total Refinery are required.</p>	<ul style="list-style-type: none"> Alcoa agrees that modelling and verification work relating to noise emissions from any future refinery expansion should consider the cumulative noise of the expansion works and existing refinery. This is considered normal practice. In line with this, if Condition 11 is retained, Alcoa agrees that elements 1, 2 and 3 of the Plan required by proposed revised condition 11-1 should be amended to reflect both the expansion works and existing refinery. However, as indicated above, Alcoa considers condition 11 should be removed given the CEO's powers relating to Works Approvals under Part V of the EP Act.
Inland Waters		
Kwinana Peel Region (KPR)	KPR was unable to locate which agency requested the original condition 12 (Water Use) of MS 728 and 1069 and is therefore unaware of the original intent of the condition. Alcoa is requested to provide the relevant context of how and why condition 12 was included within MS 728 and 1069.	<ul style="list-style-type: none"> Alcoa considers that water use for the Wagerup refinery is best regulated under the <i>Rights in Water and Irrigation Act 1911</i> (RIWI Act) and associated policies and guidelines. The proposal to expand Wagerup refinery from 2.4 Mtpa to 4.7 Mtpa was assessed at the level of Environmental Review and Management Programme (ERMP) under the ENVIRONMENTAL IMPACT ASSESSMENT (PART IV DIVISION 1) ADMINISTRATIVE PROCEDURES 2002. It was practice under these procedures to require Management Plans to be prepared as part of the ERMP process. In accordance with this Alcoa prepared a Water Use Management Plan (WUMP) (ERMP Section 10). Condition 12 of MS728 was set in 2006 requiring the WUMP to be prepared to the requirements of the Minister for Environment, on the advice of the EPA. This was on the basis that expansion would occur in one increment from 2.4 Mtpa to 4.7 Mtpa. Alcoa is now proposing to expand the refinery in smaller increments, with the initial increment from the current approved capacity of 2.85 Mtpa to 3.3 Mtpa.

Submitter	Submission and/or issue	Response to Comment
		<ul style="list-style-type: none"> • Since the original condition was set, predecessor departments to DWER have prepared and adopted <i>Operational Policy 1.02 - Policy on water conservation/efficiency plans (2009)</i> and <i>Operational Policy 5.08 – Use of Operating Strategies in the licensing process (2011)</i>. These set out how water conservation and efficiency can be regulated through water use licencing under the RIWI Act. • Alcoa has a water licence under the RIWI Act for the Wagerup refinery, and it has a requirement to have an Operating Strategy which includes a section on water conservation and efficiency. • Alcoa therefore considers any Part IV condition simply duplicates these powers and its preference remains that condition 12 be deleted.
	<p>The Water Use Management Plan may be required as part of industry regulation's processes and PIB should also be consulted with in regard to its removal or amendment of the condition. Alcoa is requested to provide proof of consultation with PIB on the proposed removal/change of this condition.</p>	<ul style="list-style-type: none"> • Water use and efficiency is not usually regulated under Part V of the EP Act. As indicated above, Alcoa considers that water use and efficiency is best regulated under the RIWI Act and associated policies and guidelines. • Alcoa discussed the proposed change with PIB during a meeting held on 25 February 2020. DWER indicated no concerns relating to the proposed condition removal.
	<p>Information on how water use efficiency and reuse is, or will be, addressed within Alcoa's water licenses and associated draft Operating Strategy has not been provided. Alcoa is requested to provide clarity as to how and where these matters will be addressed, either via a revised draft Operating Strategy, or explain when the KPR should expect a revised draft Operating Strategy with the above matters addressed.</p>	<ul style="list-style-type: none"> • Appendices A and B of DWER <i>Operational Policy 1.02 – Policy on water conservation/efficiency plans (2009)</i> provide a detailed Framework and Guidelines for development water conservation/efficiency plans. • Alcoa considers that provision of the information required by Operational Policy 1.02 through the Operating Strategy for the Wagerup refinery water licence is the most appropriate means for regulating water conservation and efficiency for the refinery. • Alcoa met with DWER Kwinana Peel region on 10 February 2020 to discuss a revision of the Operating Strategy to ensure it meets the requirements for water conservation and efficiency. A revised draft will be provided to DWER KPR to address this requirement.
	<p>KPR is unaware as to whether Alcoa's current water licenses are sufficient for the proposed expansion works and increased production, and whether there is a need for water efficiency and re-use measures in regards to water availability. Alcoa is requested to provide this information</p>	<ul style="list-style-type: none"> • The existing licence allocation is sufficient to meet water requirements for expansion of the refinery to 3.3 Mtpa. • Water use will be documented in the works approval application for the Expansion Works to 3.3Mtpa. In addition and as per discussions with KPR

Submitter	Submission and/or issue	Response to Comment
	<p>so that an assessment can be undertaken in regards to the proposed changes.</p> <p>KPR is currently reviewing Alcoa's groundwater and surface water licences, as well as the associated draft Operating Strategy for the Wagerup Refinery. KPR requests Alcoa provide a new version of the Operating Strategy, setting out how the water efficiency requirements of condition 12 MS 728 and 1069 will be addressed, and consideration of relevant policies such as <i>Operational Policy 5.08 – Use of Operating Strategies in the licensing process (DoW 2011)</i> and <i>Operation Policy 1.02 – Policy on water conservation/efficiency plans (DoW 2009)</i>.</p> <p>KPR is of the view that, until water use efficiency has been adequately addressed as above, condition 12 should remain within MS 728 and 1069.</p>	<p>on 10 February 2020, the Operating Strategy will be revised to reflect water use considerations for any future Expansion Works.</p> <ul style="list-style-type: none"> Condition 12 specifies only that the WUMP describe <i>'the water use minimisation and re-use practices that will be employed so as to achieve the minimum practicable water use at the refinery.'</i> Appendices A and B of DWER <i>Operational Policy 1.02 – Policy on water conservation/efficiency plans (2009)</i> provide a detailed Framework and Guidelines for development water conservation/efficiency plans. Alcoa met with DWER Kwinana Peel region on 10 February 2020 to discuss a revision of the Operating Strategy to ensure it meets the requirements for water conservation and efficiency. A revised draft will be prepared by Alcoa and submitted to KPR for review. <ul style="list-style-type: none"> For the reasons set out above, Alcoa considers that water use for the Wagerup refinery is best regulated under the <i>Rights in Water and Irrigation Act 1911 (RIWI Act)</i> and associated policies and guidelines. This includes the requirement for an Operating Strategy which will be revised to address water use efficiency.
	<p>KPR requests Alcoa provide clarity regarding the proposed changes in wording, particularly:</p> <ul style="list-style-type: none"> Does Alcoa intend for the Operating Strategy to replace the Water Use Management Plan? The current condition 12 of MS 782 and 1069 requires a Water Management Plan for the refinery as a whole, whereas the proposed changes to the condition would require a Water Management Plan for the expansion to 3.3 Mtpa only. Please clarify whether this interpretation is correct, as KPR considers water use efficiency should continue to be addressed for the refinery as whole. 	<ul style="list-style-type: none"> For the reasons set out above, Alcoa considers that water use for the Wagerup refinery is best regulated under the <i>Rights in Water and Irrigation Act 1911 (RIWI Act)</i> and associated policies and guidelines. The Wagerup Operating Strategy is the appropriate mechanism to address Water Use Management. The Operating Strategy will be revised to ensure water use efficiency is addressed. The Operating Strategy reflects the refinery as a whole, not just the expansion works. Expansion Works will be considered in the revision of the Operating Strategy as discussed with DWER KPR on 10 February 2020.
Other Matters		
PIB	<p>2018 Wagerup Refinery Emission Inventory, Table 1 –</p> <ul style="list-style-type: none"> The proposed expansion works to 3.3 Mtpa includes the construction of an additional calciner. While proposed condition 8 focuses on VOCs and odour, PIB notes the 	<ul style="list-style-type: none"> Alcoa recognises that calcination can contribute significant products of combustion and particulates in addition to VOCs and odour. In accordance

Submitter	Submission and/or issue	Response to Comment																
	<p>significant contribution of products of combustion and particulates from calcination to average emissions rates.</p> <ul style="list-style-type: none"> Priority VOCs are defined in the licence and applies only to VOCs from calcination for the purposes of limiting and calculating annual VOC emissions rates. The reference to Priority VOCs against other sources is unclear. Documentation generally should be clear in their varying use of Priority VOCs, Total VOCs and VOCs terminology. 	<p>with the conditions, the Detailed Design Report will identify best practice emission measures to be applied for these pollutants.</p> <ul style="list-style-type: none"> Alcoa will review the terminology for VOCs in the Emission Inventory and design reports. 																
	<p>A works approval application would be expected to consider emissions more broadly than VOC and odour which are targeted within condition 8-1 and 8-1A. Further discussion with Alcoa in due course may clarify further, however it could lead to a DDA that has undergone peer review in relation to VOCs and odour, however other point source and fugitive emissions that have not been interrogated to the same extent.</p>	<ul style="list-style-type: none"> While it is agreed that conditions 8-1 and 8-1A focus on VOCs and odour, the conditions include generally that details of '<i>best practice pollution control measures employed to minimise emissions from the Refinery</i>' be applied. Alcoa considers that the combination of the Detailed Design Report as required by conditions 8-1 and 8-1A, in combination with the Works Approval process will ensure all key emission sources for the refinery which could be affected by any expansion will be rigorously considered. 																
	<p>National Pollutant Inventory (NPI) data indicates significant recent increases in point source emissions of mercury to air:</p> <table border="1" data-bbox="383 970 1086 1425"> <thead> <tr> <th data-bbox="389 975 647 1070">Year</th> <th data-bbox="654 975 1079 1070">Mercury emissions (kg/annum)</th> </tr> </thead> <tbody> <tr> <td data-bbox="389 1075 647 1123">2011/12</td> <td data-bbox="654 1075 1079 1123">120</td> </tr> <tr> <td data-bbox="389 1128 647 1176">2012/13</td> <td data-bbox="654 1128 1079 1176">160</td> </tr> <tr> <td data-bbox="389 1181 647 1228">2013/14</td> <td data-bbox="654 1181 1079 1228">180</td> </tr> <tr> <td data-bbox="389 1233 647 1281">2014/15</td> <td data-bbox="654 1233 1079 1281">320</td> </tr> <tr> <td data-bbox="389 1286 647 1334">2015/16</td> <td data-bbox="654 1286 1079 1334">250</td> </tr> <tr> <td data-bbox="389 1339 647 1386">2016/17</td> <td data-bbox="654 1339 1079 1386">350</td> </tr> <tr> <td data-bbox="389 1391 647 1439">2017/18</td> <td data-bbox="654 1391 1079 1439">300</td> </tr> </tbody> </table>	Year	Mercury emissions (kg/annum)	2011/12	120	2012/13	160	2013/14	180	2014/15	320	2015/16	250	2016/17	350	2017/18	300	<ul style="list-style-type: none"> This matter will be addressed in information provided as part of the Works Approval application or via risk based review of the licence.
Year	Mercury emissions (kg/annum)																	
2011/12	120																	
2012/13	160																	
2013/14	180																	
2014/15	320																	
2015/16	250																	
2016/17	350																	
2017/18	300																	

Submitter	Submission and/or issue	Response to Comment
	<p>DWER does not currently have information to indicate whether the increases are within the long-term outlook mass balance approach taken to mercury, related to the oxalate kiln recommissioning project, production increases, variation in bauxite feed material mercury content, short-term variation in liquor mercury concentrations or a combination of factors. It is noted the Inventory Report prioritises mercury monitoring from multiple sources. However, Alcoa should also clarify reported NPI trends in mercury emissions in comparison to 2005 ERMP predictions and any implications for 3.3 Mtpa expansion works.</p>	

Appendix 2

Response to submissions provided to EPA December 2019 (AQSB and CAPS)

Submitter	Submission and/or issue	Response to Comment
Air Quality		
<p>Air Quality Services Branch (AQSB)</p>	<p>Evidence suggests the cooling towers (CTs) are not a minor source of acetone and formaldehyde emissions as represented by the report. Alcoa claims considerable work has been undertaken over an extensive period to estimate Volatile Organic Compound (VOC) emissions from the CTs, particularly 45K. Alcoa concluded that the CTs are only a minor source of acetone and formaldehyde emissions, based on the following:</p> <ul style="list-style-type: none"> • A literature search was undertaken of potential direct emission measurement methods for CTs, aimed at reliable measurement of formaldehyde and continuous measurement over a period of time to ascertain emission variability; • Implementation of a trial of the Open Path Fourier Transform Infrared Spectroscopy (OP-FTIR) measurement technique, identified from the literature search; • Further characterization using conventional emission sampling methods during the OP-FTIR trial; and • Review of historical cooling tower water quality data and additional water quality testing of key cooling tower water streams to enable calculation of mass loads of acetone and formaldehyde to the cooling towers. <p>AQSB disagrees with Alcoa’s conclusion due to the following:</p> <ul style="list-style-type: none"> • Alcoa has not provided AQSB with its literature search on emissions measurement methods for CTs. AQSB has previously advised Alcoa of established methods that are not based on OP-FTIR techniques. • AQSB provided technical advice in June 2019 on sections of a technical report provided by Alcoa <i>Advanced Optical Remote Sensing Technology Study</i> 	<ul style="list-style-type: none"> • Appendix 2 of the S46 document clearly sets out additional analysis beyond the 2014 report to justify the emissions proposed in the 2018 Emissions Inventory (2018 EI) for the CTs. This is based on both a review of the historical monitoring data and the water balance analysis. • Alcoa disagrees with the comment that ‘Alcoa concluded that the CTs are an insignificant source of acetone and formaldehyde emissions based on only a few water samples’. The approach adopted by Alcoa incorporated a review of all historical measured data for the CTs. Importantly, as indicated in the Appendix 2 of the S46 document, the emissions included in the 2018 EI for the 45K CTs adopt a conservative approach by maintaining the peak measured acetone and formaldehyde recordings for the CTs from 2002, even though current water balance analysis indicates such high levels would not be possible. • Alcoa accepts that further water quality monitoring of the CTs is appropriate to verify on-going low emissions and has implemented a program of regular CT water quality testing for this purpose commencing January 2020.

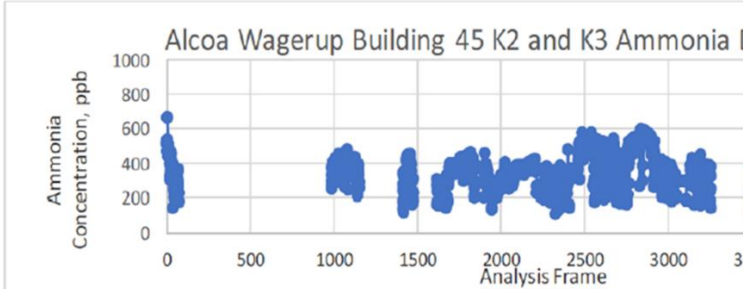
Submitter	Submission and/or issue	Response to Comment
	<p data-bbox="383 188 1084 347">- <i>Measurement of Wagerup Cooling Tower Emissions by OP-FTIR</i> (Alcoa Alumina, 2019). AQSBS has indicated concern regarding the appropriateness of the monitoring approach to reflect actual emissions from the CTs.</p> <ul data-bbox="338 360 1084 1203" style="list-style-type: none"> <li data-bbox="338 360 1084 692">• A number of inconsistencies have been identified between the CT monitoring data collected by the OP-FTIR monitor and concurrent stack and water measurements (CT water samples and conventional stack testing data). For example, formaldehyde and acetone (known chemicals that have been historically identified in CT water samples, Alcoa stack emissions and in ambient monitoring data around Alcoa in Wagerup) have not been detected by OP-FTIR during the 2017 trial. <li data-bbox="338 705 1084 999">• On the other hand, a number of chemicals such as methanol, carbon tetrachloride, chloroform, dichlorodifluoromethane and trichlorofluoromethane that have not been historically detected in CT feed water or in CT emissions measured by conventional stack testing methods, were identified by OP-FTIR at reasonable concentrations. This suggests that the OP-FTIR is not a reliable measurement method for VOCs monitoring at Alcoa CTs. <li data-bbox="338 1011 1084 1203">• It appears Alcoa concluded that the CTs are an insignificant source of acetone and formaldehyde emissions based on only a few water samples (collected on 26 April 2017 and 1 May 2017). These limited numbers of water samples are inadequate to determine accurate baseline emission levels for CTs. <p data-bbox="338 1225 1084 1390">It should be noted that the 2014 report (Wagerup Air Quality Action Plan Report prepared for the CSIRO Resolution Committee) identified acetone and formaldehyde as the largest potential VOC emissions from the CTs.</p>	

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	<p>Water sampling data collected at the 45K CTs indicated that the recirculating water stream has higher formaldehyde concentrations than the make-up water. This means that the formaldehyde “mass out” is greater than “input”. By definition, this is not possible, unless formaldehyde enter the 45K CTs from another emission source.</p> <p>Alcoa considers that chemical and microbial processes occurred in the 45K cooling towers are responsible for this discrepancy. However, AQB considers that the likely source of formaldehyde (and other VOC species) would be condensate VOCs entering the process from the digestion area. Alcoa has discussed this process in the August 2019 report “Estimation of Volatile Organic Compound Emissions from 45K Cooling Towers at Wagerup Refinery”.</p>	<ul style="list-style-type: none"> • AQSB states that it ‘considers that the likely source of formaldehyde (and other VOC species) would be condensate VOCs entering the process from the digestion area’. • As set out in Appendix 2 of the S46 document, the 45K CTs receive make-up water from the Lower Dam. Footnote 2 on page 4 of Appendix 2 states that the ‘Lower Dam where it undergoes dilution, water is sourced from rainfall runoff and digestion condensate’. That is, the digestion condensate is discharged into the Lower Dam and any residual VOC load of the condensate is included in the mass-balance calculation for the CTs through the make-up water from the Lower Dam. There is not a separate input mass from digestion condensate. • Formaldehyde has not been detected in the Lower Dam make-up water to the CTs. • CTs 45K2 and 45K3 utilise timber as the fill media to aid the cooling processes. As indicated in Appendix 2, formaldehyde can be generated by microbial processes and the presence of timber within the CTs. This has been taken into account in the mass balance analysis.
	<p>Alcoa presented its proposed approach to model validation to AQS in November 2019. Additional meetings have been requested by Alcoa to seek feedback on the initial meeting and to present Phase 2 of the proposed studies.</p> <p>The approach proposed by Alcoa uses a different suite of models and methodology (from those used for the ERMP) for generating the meteorological data and estimating ground level concentrations. While the general approach described by Alcoa is potentially fit for purpose, the details of the modelling are still to be discussed and are critically important, including:</p> <ul style="list-style-type: none"> • The specific configurations adopted for CALMET and CALPUFF • How well the model can simulate the very complex meteorological conditions that we know occur in the region, for example, scarp flow patterns such as the extent location and frequency of 	<ul style="list-style-type: none"> • The comments are noted. Alcoa has appreciated the opportunity to meet with AQS in November and December 2019 to discuss the air quality modelling approach, particularly in relation to condition 9 of MS 728. Alcoa submitted a report on the air quality modelling in relation to condition 9 to DWER in January 2020. • With respect to the air quality modelling work at Wagerup, Alcoa disagrees with the comment that there has been an ‘historical lack of effort by Alcoa to investigate this fully’. • Alcoa in consultation with the CSIRO and recognised competent air quality modelling consultants has undertaken extensive work on developing and verifying the Wagerup air quality model over some 15 years. • The work has shown the models used (TAPM and Calpuff) perform well for most dispersion pathways. The work has concluded that there is some uncertainty in model predictions for dispersion of near surface emissions from low level refinery sources during night and early morning hours in light wind, stable conditions (CSIRO Pathway 5). However, field monitoring has

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	<p>recirculating regions and historical lack of effort by Alcoa to investigate this fully.</p> <ul style="list-style-type: none"> The approach to validation. This includes the statistical analysis for assessing model skill, noting there were a range of uncertainties associated with the original ERMP modelling, including the lack of complex dispersion pathways. This also includes the use of indicator compounds (NO_x and acetone), noting some apparent limitations in the emissions inventory as discussed above. Available observational data are likely too sparse. The use of a single profile to capture potentially complex three dimensional flows is unlikely to be successful. If a single profile is provided then that will extend to the whole modelling domain. <p>AQSB is unaware of the status of the work, noting that there was no departmental “approval” of the approach discussed at the November meeting. Our recent experience with other proponents for major developments is that approval is assumed simply because we have been advised of a particular approach, leading to modelling work being progressed that is not fit for purpose.</p>	<p>shown that concentrations of VOCs during these conditions are generally no higher than during other dispersion pathway conditions.</p> <ul style="list-style-type: none"> An important matter to consider with respect to the reliability and confidence of the model, is that since the ERMP assessment there have been two intense ambient air quality monitoring programs carried out including substantial VOC monitoring. Limited ambient VOC monitoring had been undertaken at the time of the ERMP assessment. The monitoring programs have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. There are some short-term elevations in the concentration of some compounds including NO_x and acetone, that are attributable to the Wagerup refinery, however, the concentrations measured during these events are low and substantially below levels which would normally cause odour nuisance. For example, the maximum concentration of acetone recorded during the studies was 10 parts per billion (ppb) compared to a health Effects Screen Level of 2,500 ppb (DER 2009). The maximum one-hour NO₂ level recorded was around 20 ppb compared to the NEPM health standard of 120 ppb (DER, 2009). The GLC’s predicted by the Wagerup model are consistent with the very low levels of pollutants being measured in the Wagerup locality.
	<p>AQSB provides the following comments, based on Alcoa’s proposed approach to model validation:</p> <ul style="list-style-type: none"> The purpose of the modelling: <ul style="list-style-type: none"> The purpose of the Wagerup air quality model, as developed for the ERMP ground level concentrations from refinery emissions with sufficient accuracy - a <u>conservative</u> Health Risk Assessment to be undertaken of emissions from the refinery; and - an assessment of the likelihood of amenity impacts which could occur from changes in emission characteristics of the refinery, based on comparison of changes in GLCs. <p><u>Comments:</u> The comparative modelling approach seems to be a departure from the original condition wording that required specific emissions reductions.</p>	<p><u>The purpose of the modelling</u></p> <ul style="list-style-type: none"> The proposed amendments to condition 9 of MS 728 do not involve any departure from the fundamental requirements of the existing condition 9. Inclusion of the reference to ‘comparative modelling’ is to meet the requirements of DWER’s recently released draft Odour guideline for prescribed premises. <p><u>The purpose of condition 9 modelling</u></p> <ul style="list-style-type: none"> Condition 9 requires Alcoa to: <ol style="list-style-type: none"> undertake specified further ‘data acquisition and investigations’; validate the performance of the dispersion model taking into consideration the data acquisition and investigations; and

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	<ul style="list-style-type: none"> • The purpose of condition 9 modelling: <ul style="list-style-type: none"> Alcoa's interpretation <ul style="list-style-type: none"> ▪ An implicit requirement to validate (to verify subsequent to the ERMP), that predicted ERMP are met, when Condition 9 model refinements and improvements are completed. <u>Comments:</u> <ul style="list-style-type: none"> ○ The aim is to ensure no increase in ambient air quality impacts above the baseline case (pre ERMP?). ○ The model is different so the base case of pre and post ERMP changes are considered. Both the base case and proposed changes in plant configuration and output will need to be modelled. ○ Verification should use contemporary emissions, meteorology and ambient concentrations. ○ CEMs should be a requirement of best practice air quality management for a large contentious site. ○ Ongoing ambient monitoring should also be considered as key component of best practice air quality management for a large contentious site. • The proposed model validation: 	<ul style="list-style-type: none"> iii. provide details of whether the GLCs predicted with the updated air dispersion model and design emission targets from proposed expansion works are consistent with the predictions presented in the ERMP. • Alcoa understands the condition requirements are to ensure that with the upgraded model, the predicted GLCs are consistent with those in the ERMP, which were shown to meet Health Risk Assessment requirements to ensure refinery emissions are well below levels that would cause any: <ul style="list-style-type: none"> ○ Acute health effects; ○ Chronic health effects; ○ Increased cancer risk. • The AQSB comment that the 'Verification should use contemporary emissions, meteorology and ambient concentrations' is also unclear. • As indicated above, condition 9 requires Alcoa to undertake specified further 'data acquisition and investigations'. This includes 12 months of additional various meteorological data and 12 months of additional base case emissions rate data for key sources. Alcoa has undertaken this. • It should be noted that the refinery has not changed its production rate or refining process significantly since the ERMP. Production has increased from only 2.41 Mtpa to 2.63 Mtpa in 2018. • With respect to any requirement for on-going ambient air quality monitoring, Alcoa considers that should be addressed as part of the Part V licencing process rather than Part IV Ministerial Statement condition. <p><u>The proposed model validation</u></p> <ul style="list-style-type: none"> • Alcoa notes the comment that use of a single vertical profile is likely to be problematic and has addressed this in its air quality modelling report. <p><u>The proposed model validation approach</u></p> <ul style="list-style-type: none"> • As indicated above, Alcoa in consultation with the CSIRO and recognised competent air quality modelling consultants has undertaken extensive work

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	<table border="1" data-bbox="394 196 1093 691"> <thead> <tr> <th data-bbox="394 196 555 371">Configuration</th> <th data-bbox="555 196 837 371">Description</th> <th data-bbox="837 196 994 371">Meteorology Predicted by</th> <th data-bbox="994 196 1093 371">Refinery Concentra Predicted</th> </tr> </thead> <tbody> <tr> <td data-bbox="394 371 555 411">1</td> <td data-bbox="555 371 837 411">As used in the 2005 HRA</td> <td data-bbox="837 371 994 411">TAPM₍₁₎</td> <td data-bbox="994 371 1093 411">TAPM</td> </tr> <tr> <td data-bbox="394 411 555 560">2</td> <td data-bbox="555 411 837 560">Evaluation of TAPM vs CALPUFF dispersion by comparing cases 1 and 2. Evaluation of TAPM vs WRF₍₂₎ meteorology by comparing cases 2 and 3</td> <td data-bbox="837 411 994 560">TAPM</td> <td data-bbox="994 411 1093 560">CALPUFF</td> </tr> <tr> <td data-bbox="394 560 555 600">3</td> <td data-bbox="555 560 837 600">WRF only meteorology</td> <td data-bbox="837 560 994 600">WRF</td> <td data-bbox="994 560 1093 600">CALPUFF</td> </tr> <tr> <td data-bbox="394 600 555 691">4</td> <td data-bbox="555 600 837 691">Use of CALMET for generating meteorology inputs (assimilation of vertical profile data)</td> <td data-bbox="837 600 994 691">CALMET</td> <td data-bbox="994 600 1093 691">CALPUFF</td> </tr> </tbody> </table> <p data-bbox="380 719 533 751"><u>Comments:</u></p> <p data-bbox="380 762 1066 863">The proposal is to use configuration 4 which is using Calmet using observations to drive Calpuff. The use of a single vertical profile is likely to be problematic.</p> <ul data-bbox="336 916 922 948" style="list-style-type: none"> <li data-bbox="336 916 922 948">• The proposed model validation approach: <div data-bbox="394 959 1093 1353" style="background-color: #e0f0ff; padding: 5px;"> <p data-bbox="394 959 1093 983">Condition 9 Validation Modelling - Scope being undertaken by Environmental Technology and</p> <ul data-bbox="394 1015 1093 1353" style="list-style-type: none"> <li data-bbox="394 1015 1093 1062">• The aim of the Phase 2 modelling is to validate the dispersion model, as the basis for requirements of Condition 9-2: <ul data-bbox="416 1110 1093 1353" style="list-style-type: none"> <li data-bbox="416 1110 1093 1134">- incorporate the results of the data acquisition and investigations undertaken by Alcoa in accord <li data-bbox="416 1142 1093 1182">- use surface and profile meteorological measurements collected by Alcoa & CSIRO in accordan emissions dispersion modelling; <li data-bbox="416 1190 1093 1230">- undertake model validation using ambient air quality monitoring data for oxides of Nitrogen (NO Volatile Organic Compound [VOC]) over the nominated model period (2006/07); <li data-bbox="416 1238 1093 1302">- comparing the relative change in predicted ground-level concentrations (GLCs) due to incorpor CALPUFF model adopted for Refinery sources, and treatment of building wake effects and mul (in a single model case), to be compared to the original ERMP modelling results; and <li data-bbox="416 1310 1093 1353">- developing the baseline model for Wagerup Refinery at its current maximum licensed capacity, the effect on GLC's of future incremental expansion. </div> <p data-bbox="380 1358 533 1390"><u>Comments:</u></p> <p data-bbox="331 1401 1034 1460">If the model is unable to capture the complexity of the meteorology then the uncertainty will need to offset by</p>	Configuration	Description	Meteorology Predicted by	Refinery Concentra Predicted	1	As used in the 2005 HRA	TAPM ₍₁₎	TAPM	2	Evaluation of TAPM vs CALPUFF dispersion by comparing cases 1 and 2. Evaluation of TAPM vs WRF ₍₂₎ meteorology by comparing cases 2 and 3	TAPM	CALPUFF	3	WRF only meteorology	WRF	CALPUFF	4	Use of CALMET for generating meteorology inputs (assimilation of vertical profile data)	CALMET	CALPUFF	<p data-bbox="1151 188 2119 252">on developing and verifying the Wagerup air quality model over some 15 years.</p> <ul data-bbox="1106 272 2119 911" style="list-style-type: none"> <li data-bbox="1106 272 2119 400">• All models will have a degree of uncertainty and this of course should be taken into consideration in decision making. In the case of the Wagerup air model and HRA the following factors need also to be taken into consideration: <ul data-bbox="1205 424 2119 759" style="list-style-type: none"> <li data-bbox="1205 424 2119 488">○ The conservative approaches adopted in the air modelling as outlined on pages 34 and 35 of the Section 46 Document; <li data-bbox="1205 504 2119 608">○ The extensive ambient air quality monitoring undertaken in the locality which has shown concentrations of pollutants well below health guidelines consistent with the modelling; and <li data-bbox="1205 624 2119 759">○ The health impact assessments of emissions from the Wagerup refinery have been well within what are considered acceptable levels, ie there is a considerable buffer between predicted GLC's of pollutants and air quality health guidelines. <li data-bbox="1106 775 2119 911">• The extensive air quality model development and verification work and results of ambient air quality monitoring provide a very sound degree of confidence for assessment of any potential health impact from expansion of the Wagerup refinery.
Configuration	Description	Meteorology Predicted by	Refinery Concentra Predicted																			
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	<p>increasing conservatism or greater focus on reducing VOC's.</p> <p>AQSB noted some emissions rates that will be used for modelling assessments do not appear to be correct, including CT ammonia emission rates. Noting that the FT-IR method is very sensitive and reliable in its detection of ammonia, this substance has been detected at reasonable concentrations in CT emissions measured by OP-FTIR in 2017 (Table A) as well as in water samples collected from the precipitation CTs (Table B). Emission rates of zero are shown for all CTs (Table C, below). Consequently, the emission data cited in "2018 Wagerup Refinery Emission Inventory Report" do not appear to be representative of Alcoa CT emissions. Ammonia emission rates for other sources are included in the 2018 base case. Ammonia is an odorous compound.</p> <p>Table A: 2017 Ammonia Concentrations at Cooling Tower</p> 	<ul style="list-style-type: none"> Alcoa provided its report on the OP-FTIR work to DWER in May 2019 and was advised that DWER did not consider the technology appropriate for measuring CT emissions. No mention was made that DWER considered OP-FTIR technology appropriate for ammonia while being inappropriate for other substances. Alcoa did not include the ammonia emission rates measured in the initial Emission Inventory using OP-FTIR in the 2018 EI based on the DWER advice. Nevertheless, Alcoa will proceed to include ammonia emission rates in an updated 2018 Emissions Inventory based on the water balance method. The calculation of water balance ammonia emission rates will be provided in the updated 2018 Emission Inventory. Table 1 compares the estimated emission rate from water balance method with the results from the OP-FTIR work and also some earlier stack sampling which was non-detect, but where Alcoa has used ½ detection limit. The estimated emissions from the three methods are all very similar. Alcoa considers that the water balance approach results are the most appropriate and will incorporate them into an updated 2018 Emissions Inventory to be provided to AQSB. <p>Table 1: Comparison of water balance, OP-FTIR and manual stack sampling</p> <table border="1" data-bbox="1167 1070 2056 1423"> <thead> <tr> <th data-bbox="1167 1070 1565 1423">Method</th> <th data-bbox="1565 1070 1794 1423">Average Ammonia Air Emission Concentration</th> <th data-bbox="1794 1070 2056 1423">Peak Ammonia Air Emission Concentration</th> </tr> </thead> <tbody> <tr> <td></td> <td data-bbox="1565 1299 1794 1423">Wet mg/m³</td> <td data-bbox="1794 1299 2056 1423">Wet mg/m³</td> </tr> </tbody> </table>	Method	Average Ammonia Air Emission Concentration	Peak Ammonia Air Emission Concentration		Wet mg/m ³	Wet mg/m ³
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Table B: 2017 VOC and ammonia Concentration in Cooling Tower

	PQL (mg/L)	Feedwater				Recirc	
		26-Apr	26-Apr	1-May	Average	26-Apr	26-Apr
Formaldehyde	0.01	nd	nd	nd		0.21	0.21
Acetone	0.01	0.33	0.41	0.3	0.35	0.06	0.07
2,4-dimethylphenol	0.1	6.8	6.4	5.6	6.27	2.4	2.3
2-methylphenol	0.1	5.7	4.7	4	4.8	0.4	1
2-Picoline	0.1	0.7	0.5	0.3	0.5	nd	nd
3- and 4-methylphenol	0.1	3.7	2.9	1.9	2.83	1.2	0.6
Ammonia	0.05	13	12	12	12	5.9	2.4

Table C: 2018 Base Case Emission Rates

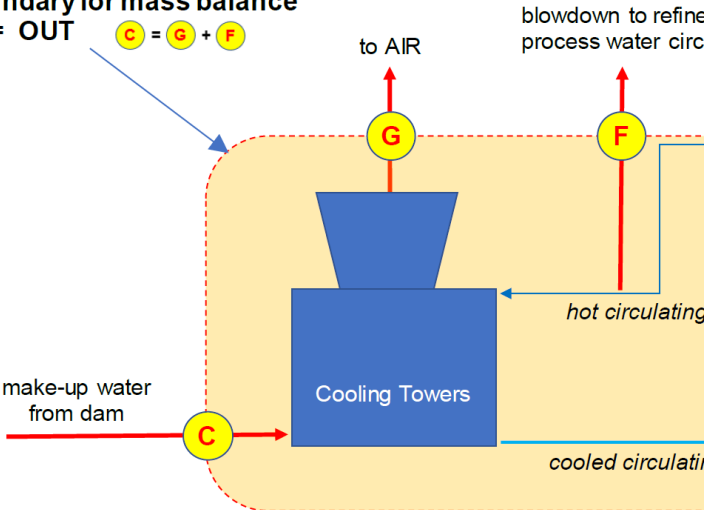
Source	Stack Diameter m	Stack Height m	Average Stack Flow - DRY Dry Nm3/hr	Average Stack Gas Moisture %	Average Stack Flow - WET Wet Nm3/hr	Products of Combustion		
						NOx g/s	CO g/s	SO2 g/s
Combustion Equipment Point Sources:								
Liquor Burning	1.10	100.0	52477	5%	55355	2.02	0.22	0.024
Calciner 1	1.90	100.0	64625	50%	128224	1.70	2.86	0.14
Calciner 2	1.90	100.0	68141	49%	133872	1.68	2.85	0.10
Calciner 3	2.15	100.0	98733	40%	165382	3.34	1.18	0.10
Calciner 4	2.35	48.8	116528	47%	218217	4.00	6.08	0.12
Boiler 1	2.40	65.0	153796	17%	185989	10.32	0.10	0.062
Boiler 2	2.00	65.0	111609	16%	133185	2.61	0.57	0.050
Boiler 3	2.00	65.0	104589	17%	125406	3.32	0.75	0.045
Gas Turbine 1	3.05	40.0	366186	8%	397079	2.90	5.27	0.25
Oxalate Kiln	1.00	36.8	34950	6%	37019	0.32	0.053	0.025
Non-Combustion Equipment Point Sources:								
Calciner 1-3 Low Volume Vent	0.35	100.0	1841	42%	3174	8.69E-04	0.00	0.00
45K Cooling Tower 2	7.32	17.5	1509662	12%	1723701	N/A	N/A	N/A
45K Cooling Tower 3	7.32	17.5	1550049	12%	1769462	N/A	N/A	N/A
45K Cooling Tower 1	7.25	9.0	1045812	12%	1165997	N/A	N/A	N/A
50 Cooling Tower 1	3.00	4.9	2824	17%	3420	N/A	N/A	N/A
50 Cooling Tower 2	3.00	4.9	2824	17%	3420	N/A	N/A	N/A

Water Balance <ul style="list-style-type: none"> 3 water samples April/May 2017 	0.338	0.357	
OP-FTIR (2017) <ul style="list-style-type: none"> 1 Hour data 13 days April/May 2017 	0.257	0.419	
Manual stack sampling (USEPA CTM-027) <ul style="list-style-type: none"> 4 samples non-detect in 2005 ½ detection limit for non-detect 	0.205	0.205	

Alcoa used a mass balance calculation for the estimation of VOC emissions. DWER recognises the mass balance method as an established approach for estimating emissions of VOCs from CTs. However, the calculation assumptions and the mass balance calculation formula used by Alcoa appear to be inaccurate.

Inaccurate assumption: One of the assumptions used by Alcoa to calculate VOCs emission rates for CTs is that there is no cross contamination from the product being cooled to the cooling water in the heat exchange process. However, Alcoa stated that there are some condensate VOCs entering the process from the digestion area as follows: *“Since the condensate from the digestion area contains some VOCs, emissions from the*

- The calculation assumptions and the mass balance calculation formula used by Alcoa are not inaccurate.
- As set out in Appendix 2 of the S46 document, the 45K CTs receive make-up water from the Lower Dam. Footnote 2 on page 4 of Appendix 2 states that the ‘Lower Dam water is sourced from rainfall runoff and digestion condensate’. That is, the digestion condensate is discharged into the Lower Dam and any residual VOC load of the condensate is included in the mass-balance calculation for the CTs through the make-up water from the Lower Dam. There is not a separate input mass from digestion condensate. Condensate VOCs are therefore included in the mass-balance calculations presented by Alcoa
- With respect to potential Leak losses, as noted by AQSB these are expected to be negligible. With respect to Drift losses, the 45K CTs are

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	<p>45K cooling towers could contain VOC's if VOCs are stripped into the cooling tower air stream and discharged to the atmosphere".</p> <p>We note that these condensate VOCs have not been considered in the calculations.</p> <p>Formula used: Alcoa used a simplified form of the mass balance formula to estimate the mass load of VOCs in the CT as follows (Figure 3):</p> <p>Input mass = Output mass</p> <p>Make-up Water (as input mass) = Evaporation + Blowdown (as output mass)</p> <p>Boundary for mass balance</p> <p>IN = OUT $C = G + F$</p>  <p>Figure 3: Schematic Showing Boundaries of the Cooling Tower</p> <p>In our view, the mass balance formula should be (additions highlighted):</p> <p>Condensate VOCs enter from the digestion area + Make-up Water (as input mass) = Evaporation + Blowdown + Drift + Leaks (as output mass)</p> <p>The components of the process are:</p> <ul style="list-style-type: none"> • Condensate VOCs enter the process from the 	<p>fitted with drift eliminators and drift losses would be typically less than 1 – 2% of make-up water flow. The inclusion of 1 – 2% drift losses in the mass-balance equation would make minor effect on the calculated emission rates of VOCs to air, and would in fact, reduce the calculated emissions to air if included. The approach adopted by Alcoa is therefore conservative.</p> <ul style="list-style-type: none"> • The disinfectant and anti-scaling chemicals added to the CTs to control corrosion, algae and bacteria growth do not contain VOCs. These additives are standard practice for CTs across a range of industrial, power and general applications. In addition, the water quality testing at Wagerup has shown that apart from acetone and formaldehyde, all other VOCs in the CT make-up water and recirculating water are at concentrations of thousandths of mg/L. These concentrations are such that the mass emissions of these compounds would be negligible.

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	<p>digestion area (according to Alcoa)</p> <ul style="list-style-type: none"> • Evaporation occurs as part of the heat removal process for which the tower is designed. • Drift occurs when water is carried away from the tower in the form of mist or small droplets. • Blow-down or Bleed-off is required when the concentration of dissolved solids gets too high as the result of water evaporation. • Basin Leaks and/or Overflows, which appear to be common. When water is removed from a Cooling Tower it must ultimately be replaced by make-up water. <p>Given that Alcoa has improved the design and management of CTs recirculating water system, “Basin Leaks / Overflows” would be expected to be negligible.</p> <p><i>Excluding drift loss from Mass Balance Calculation:</i> Drift loss is one of the items that need to be considered in the mass balance calculations. This refers to the loss of water as a result of entrainment in the air flow as drift loss (typical values for drift loss are 0.1–0.2% of the recirculation rate).</p> <p>Alcoa stated that drift losses of water particles from the cooling towers are insignificant but did not mention what the level of drift loss is for the CTs and excluded this parameter from calculations. The drift loss needs to be quantified and applied in the calculation process.</p> <p>In addition, disinfectant and anti-scaling chemicals added to the cooling towers as a control measure to avoid corrosion, algae and bacteria growth (e.g. legionella) could be another source of VOCs enter to CTs to the process.</p>	
<p><u>Condition 8-1/8-1A</u></p>	<p>The proposed changes seem to represent a significant change in the overall approach. That is, the original condition required specific emission reductions for a number of key sources. The proposed wording for 8-1 removes the requirement to reduce emissions from key</p>	<ul style="list-style-type: none"> • The proposed changes to condition 8 do not change the fundamental requirement of the condition, that is Alcoa must demonstrate best practice pollution control measures are applied to any future expansion works.

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	<p>sources. The proposed wording for 8-1A has a general requirement to achieve “no overall increase in VOC or odour emissions” and “consider potential emission reduction measures” for some sources.</p> <p>AQSB note in particular that the CTs are not mentioned at all in condition 8 and that there are no specific emission reduction requirements for the calciners. Cumulatively, these sources represent a significant proportion (over 60% for base case) of VOC and odour emissions (see Table 1 in response to Q5).</p> <p>We presume that the original condition wording, including the requirement for specific emission reductions, was based on an overall lack of knowledge at the time of the causative agents or processes leading to amenity impacts, and therefore the need for best practice emissions control and continuous improvement. AQSB are not sure if the state of knowledge has changed appreciably since that time.</p> <p>Condition 8 is referred to in both condition 9 and 10, which means that changes in condition 8 will have flow-on consequences for conditions 9 and 10.</p> <p>In addition, we note that “no increase in VOC emissions” is not the same as “no increase in VOC GLCs”. That is, a similar VOC inventory but with different source configurations could result in different GLC outcomes.</p>	<ul style="list-style-type: none"> • The specific emissions reductions listed in existing condition 8 were based on proposed expansion of the refinery in one stage to 4.7 Mtpa and refinery and emissions knowledge at the time. • Section 3.2.3 of the S46 document, sets out the evaluation of VOC and odour emission abatement measures for future refinery expansions and the rationale for amendments to the list. As indicated, the principle of ensuring best practice pollution control is maintained. • With respect to calciner emissions, the S46 document clearly acknowledges that this is the largest source of VOC and odour emissions for the refinery, but that at this time there are no practicable emission control measures to capture and destroy emissions from Calciner stacks (i.e. 'end-of-pipe' emission control). However, as identified in the Appendix 3 report, Alcoa will continue to investigate opportunities to reduce VOC emissions from the calciners through management of product into the calciners and operation of the calciners. • With respect to emissions from the 45K CTs, Appendix 2 of the S46 document has shown that 45K CTs are not a key source of VOC emissions for the refinery. In addition, as part of the proposed program of further monitoring to improve the Wagerup refinery EI, further monitoring of odour emissions from the 45K CTs is proposed. It is anticipated this could show odour emission levels from the 45K CTs are also lower than currently estimated, as has been shown for VOC emissions. • AQSB has noted that ‘no increase in VOC emissions’ is not the same as ‘no increase in VOC GLCs’ and that ‘a similar VOC inventory but with different source configurations could result in different GLC outcomes’. This is understood and is a fundamental tenant of the existing approval provided by MS 728. • Condition 9 still requires Alcoa to demonstrate that GLCs for any expansions are consistent with the predictions presented in the ERMP, on which MS 728 approval was granted.
<p><u>Condition 9</u></p>	<p>Noting the flow-on effects of proposed changes to condition 8, the proposed changes to condition 9 appear to be reasonable. The wording does not preclude, nor</p>	<ul style="list-style-type: none"> • Comment noted and supported.

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<u>Condition 10</u>	<p>does it guarantee a successful outcome for modelling studies.</p> <p>For 10-1, AQSB note that the proposed changes refer to air quality “verification” rather than “management”. In our view, “management” is a more comprehensive term that implies implementation of procedures to achieve performance targets as required.</p> <p>Noting the flow-on effects of proposed changes to condition 8, it appears that major sources (i.e. CTs) would not need to be verified.</p>	<ul style="list-style-type: none"> Alcoa interprets that condition 10 was set to require verification of design emissions targets set in the Detailed Design Report for refinery expansion works. The refinery is subject to licencing under Part V of the EP Act. The licence sets on-going emissions monitoring for the refinery. Alcoa considers the Part V licence the appropriate instrument for on-going refinery emissions monitoring. With respect to emissions from the 45K CTs, Alcoa recognises that regular water quality monitoring is appropriate to verify on-going low emissions from this source and has implemented a program of regular testing for this purpose. This could be added to the Part V licence as a condition if considered appropriate.
<u>Other advice</u>	<p>Waste water in the Lower Dam may be a potential emission source for CT emissions. As a general rule, CT make-up water should be relatively high-quality water and as free as possible from contamination. AQSB notes that the quality of water (the Lower Dam water sourced from rainfall runoff and digestion condensate) used in the precipitation CTs 45K1, 45K2 and 45K3) is very low and contains reasonable concentrations of VOCs and ammonia. According to Alcoa, the emissions from other CTs that use clean water from the Upper Dam water (sourced from ‘fresh surface water’ and Yalup Brook) for cooling the calcination (50C CTs), milling and the powerhouse areas (Buildings 25, 30, 110, 48, 47 and 984Y) are negligible compared to 45K CTs (Table B).</p> <p>Alcoa stated <i>“The cooling towers require feedwater (known as make-up water) to replace the evaporating water and a bleed (blowdown) stream to limit the concentration of substances in the recirculating water.”</i> However it seems likely that make-up water used from Lower Dam could add extra substances to the CT 45 K recirculating water.</p>	<ul style="list-style-type: none"> Appendix 2 of the S46 document recognises that VOCs in make-up water from the Lower Dam, which includes condensate from the digestors, could be stripped in the CTs. The quality of the water from the Lower Dam, while not as high as that in the Upper Dam, is still relatively good and considered suitable for the CT requirements. Apart from acetone and formaldehyde, all other VOCs in the Lower Dam make-up water and recirculating water are at concentrations of thousandths of mg/L. These concentrations are such that the mass emissions of these compounds would be negligible. About two gigalitres of water is recovered to the Lower Dam through digester condensate each year. If this water was not used for cooling purposes, another source of water would need to be obtained. Alcoa considers the recovery of digester condensate and its re-use for cooling an appropriate water conservation measure.

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	<p>Given that the 45K1, 45K2 and 45K3 cooling towers:</p> <ul style="list-style-type: none"> • are large compared to other cooling towers; • have significant water and air flow rates; • are supplied with low quality make-up water (from the Lower Dam); • receive the condensate VOCs from the digestion area; <p>VOC emissions stripped into the cooling tower air stream and discharged to the atmosphere could be expected to be significantly higher compared to other cooling towers that supplied with clean make-up water from the Upper Dam.</p> <p>In addition, the seasonal variations of Lower Dam water level (expected to have lower water levels during summer due to evaporation, hence higher chemical content) could further impact CT emission rates. Therefore, it is important to compare sampling data (water samples and gaseous chemical compounds emitted from CTs) that are measured under similar conditions (i.e. season, dam water level and process conditions).</p> <p>For instance, it is stated that <i>“High levels of acetone and formaldehyde were recorded in the 2002 and 2003 period. These estimated concentrations were not consistent with 2004 and 2005 period (significantly lower than 2002-2003 period).”</i> Therefore it is important to know whether or not sampling was performed under similar seasonal and process conditions (e.g. similar throughput, emission control, etc.).</p>	<ul style="list-style-type: none"> • Alcoa disagrees with the statement that VOC emissions stripped into the 45K CT air stream and discharged to the atmosphere could be expected to be significantly higher compared to other cooling towers that supplied with clean make-up water from the Upper Dam. • As indicated above, apart from acetone and formaldehyde, all other VOCs in the Lower Dam make-up water and recirculating water are at concentrations of thousandths of mg/L. These concentrations are such that the mass emissions of these compounds would be negligible. As shown in Appendix 2, the level of acetone in the make-up water from the Lower Dam (including the digestion condensate) is low (about 0.35 mg/L) and there is no formaldehyde in the Lower Dam make-up water. • With respect to seasonality of water quality in the Lower Dam, water quality has been monitored monthly in the Lower Dam since 1989. It is acknowledged that the concentration of pollutants in the dam varies throughout the year, generally being highest at the end of summer. The mass balance calculations presented in Appendix 2 of the S46 document, used VOC measurements for April-May 2017, therefore using the time of the year with the highest potential concentrations of pollutants. • Tables 7 and 10 of Appendix 2 show seasonal variation in acetone and formaldehyde in the Lower Dam in 2004-5 (May, July, September and January). The highest acetone reading in late summer 2004 (May), being 0.37 mg/L, is similar to the reading of 0.36 mg/L for late summer 2017. The acetone level dropped to below 0.01 mg/L in winter. Therefore, adopting the acetone level of the end of summer will result in an over-estimation of annual acetone emissions from the cooling towers. No formaldehyde was measured in the Lower Dam in any of the months measured in 2004-05. This is consistent with no formaldehyde being recorded in the make-up water from the Lower Dam to the 45K cooling towers in April-May 2017. • Notwithstanding this, as indicated above, Alcoa recognises that regular water quality monitoring is appropriate to verify on-going low emissions from this source and has implemented a program of regular testing for this purpose.

Submitter	Submission and/or issue	Response to Comment																																																																						
	<p data-bbox="344 193 1093 217">Table B: 2017 VOC and ammonia Concentration in Cooling Tower (45K) Wa</p> <table border="1" data-bbox="344 225 1093 611"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2">PQL (mg/L)</th> <th colspan="4">Feedwater</th> <th colspan="2">Recircula</th> </tr> <tr> <th>26-Apr</th> <th>26-Apr</th> <th>1-May</th> <th>Average</th> <th>26-Apr</th> <th>26-Apr</th> </tr> </thead> <tbody> <tr> <td>Formaldehyde</td> <td>0.01</td> <td>nd</td> <td>nd</td> <td>nd</td> <td></td> <td>0.21</td> <td>0.21</td> </tr> <tr> <td>Acetone</td> <td>0.01</td> <td>0.33</td> <td>0.41</td> <td>0.3</td> <td>0.35</td> <td>0.06</td> <td>0.07</td> </tr> <tr> <td>2,4-dimethylphenol</td> <td>0.1</td> <td>6.8</td> <td>6.4</td> <td>5.6</td> <td>6.27</td> <td>2.4</td> <td>2.3</td> </tr> <tr> <td>2-methylphenol</td> <td>0.1</td> <td>5.7</td> <td>4.7</td> <td>4</td> <td>4.8</td> <td>0.4</td> <td>1</td> </tr> <tr> <td>2-Picoline</td> <td>0.1</td> <td>0.7</td> <td>0.5</td> <td>0.3</td> <td>0.5</td> <td>nd</td> <td>nd</td> </tr> <tr> <td>3- and 4-methylphenol</td> <td>0.1</td> <td>3.7</td> <td>2.9</td> <td>1.9</td> <td>2.83</td> <td>1.2</td> <td>0.6</td> </tr> <tr> <td>Ammonia</td> <td>0.05</td> <td>13</td> <td>12</td> <td>12</td> <td>12</td> <td>5.9</td> <td>2.4</td> </tr> </tbody> </table> <p data-bbox="344 659 1093 791">The above discussion is reflected in the comments above on the proposed condition wording changes, which seem to imply that CTs are not considered by Alcoa to be an important source.</p>		PQL (mg/L)	Feedwater				Recircula		26-Apr	26-Apr	1-May	Average	26-Apr	26-Apr	Formaldehyde	0.01	nd	nd	nd		0.21	0.21	Acetone	0.01	0.33	0.41	0.3	0.35	0.06	0.07	2,4-dimethylphenol	0.1	6.8	6.4	5.6	6.27	2.4	2.3	2-methylphenol	0.1	5.7	4.7	4	4.8	0.4	1	2-Picoline	0.1	0.7	0.5	0.3	0.5	nd	nd	3- and 4-methylphenol	0.1	3.7	2.9	1.9	2.83	1.2	0.6	Ammonia	0.05	13	12	12	12	5.9	2.4	
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	<p data-bbox="344 810 1093 1011">Alcoa's largest emission sources are Calcination, Milling Vents, Slurry Storage Tanks and Precipitation Cooling Towers (45K). These four emission sources are responsible for 99%, 78% and 79% of particulates, VOC and odour emissions, respectively, from Wagerup Refinery (Table 1).</p>	<ul data-bbox="1111 810 2128 1465" style="list-style-type: none"> • AQSB has questioned why it is not a requirement under the Part V licence for on-going characterisation of VOC and odour emissions from the Milling Vents, Slurry Storage Tanks and 45K CTs. • With respect to the Milling Vents and Slurry Storage Tanks, extensive characterisation of emissions from these sources was carried out in 2006-07. Due to the nature of the facilities, sampling is difficult and expensive. As indicated in the S46 document, as the source of bauxite and Bayer process utilised in the refinery have not changed materially over time it is not expected the range of emission concentrations from these sources will change materially either. Data from refinery sources which have been monitored over a considerable time (e.g. calciners) shows that there has not been significant change in emission concentrations. Where changes have occurred over time, concentrations have generally been lower. Measured or calculated air flow rates for these sources have been updated as appropriate as production increased. Notwithstanding this, Alcoa has proposed further characterisation of emissions from the Milling Vents as part of the emissions inventory improvement plan. Emissions from the Slurry Storage Tanks are to be captured and destroyed as part of the proposed expansion works to 3.3 Mtpa. 																																																																						

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	<p data-bbox="369 180 969 204">Table 1: Emission inventory improvement program 2006-2018</p> <table border="1" data-bbox="342 225 1093 647"> <thead> <tr> <th rowspan="2">Source</th> <th colspan="4">% Contribution to 2018 Total Refinery Average Emission Rates</th> <th rowspan="2">2006 – 2007</th> <th rowspan="2">2008</th> </tr> <tr> <th>Combustion Products</th> <th>Particulates</th> <th>VOC</th> <th>Odour</th> </tr> </thead> <tbody> <tr> <td colspan="7">Emission Inventory Improvement Program</td> </tr> <tr> <td>Milling Vents (25)</td> <td>Non-Combustion Source</td> <td>12</td> <td>11</td> <td>1.9</td> <td>VOCs Ammonia Odour</td> <td>Part Met</td> </tr> <tr> <td>Slurry Storage Tanks (25A)</td> <td>Non-Combustion Source</td> <td>Not characterised</td> <td>20</td> <td>16</td> <td>VOCs Ammonia Odour</td> <td>Met</td> </tr> <tr> <td>Precipitation Cooling Towers (45K)</td> <td>Non-Combustion Source</td> <td>Not characterised</td> <td>13</td> <td>25</td> <td>VOCs</td> <td>Met</td> </tr> <tr> <td>Oxalate Kiln RTO Stack (47)</td> <td><1</td> <td><1</td> <td><1</td> <td><1</td> <td></td> <td>Met</td> </tr> <tr> <td>Calcination</td> <td>46</td> <td>87</td> <td>34</td> <td>35</td> <td>VOCs Ammonia Odour</td> <td>Met</td> </tr> </tbody> </table> <p data-bbox="645 667 925 699" style="text-align: center;"> 99% 78% 79% </p> <p data-bbox="331 735 1041 1038"> From a regulatory perspective, we note that the Milling Vents, Slurry Storage Tanks and Precipitation Cooling Towers are responsible for almost 45% of VOC and odour, but there is no licence requirement for ongoing characterisations of these sources, whilst the Liquor Burner, Boilers (GT/HRSG) Oxalate Kiln, Calciner 1-3 and Low Volume Vent Stack are responsible for 7% of VOCs and 11% of odour, but these sources do have licence requirements. </p>	Source	% Contribution to 2018 Total Refinery Average Emission Rates				2006 – 2007	2008	Combustion Products	Particulates	VOC	Odour	Emission Inventory Improvement Program							Milling Vents (25)	Non-Combustion Source	12	11	1.9	VOCs Ammonia Odour	Part Met	Slurry Storage Tanks (25A)	Non-Combustion Source	Not characterised	20	16	VOCs Ammonia Odour	Met	Precipitation Cooling Towers (45K)	Non-Combustion Source	Not characterised	13	25	VOCs	Met	Oxalate Kiln RTO Stack (47)	<1	<1	<1	<1		Met	Calcination	46	87	34	35	VOCs Ammonia Odour	Met	<ul data-bbox="1108 188 2116 320" style="list-style-type: none"> With respect to the CTs, emissions could increase if there is a change in the amount of make-up water used or its quality. Alcoa is implementing a program of regular water quality testing for the 45K CTs to verify on-going low emissions.
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	<p>AQSB noted that the emission concentrations (odour, ammonia and VOC species) in the Blow-off Tank stacks are very high (Table 11) compared to other emission sources in Wagerup Refinery, for example calciners (Table 36). We also noted that the Blow-off Tanks are not mentioned in the emission inventory sources list (Table 1, 2018 Wagerup Refinery Emission Inventory Report). Given the high concentration levels of pollutants and odour emitted from this source, it suggests the need to keep a watching brief on the Blow-off Tanks to ensure that the emission impact, particularly for odours, does not go above modelled concentrations.</p>	<ul style="list-style-type: none"> The comment is noted. As indicated in the 2018 EI, emissions from the blow off tank vapour condensers are minimal, however, intermittent emissions can occur when heaters are offline, or when heat transfer achieved in the heaters is less than design, such that excess vapour carryover is presented to the condensers. While the emission concentrations (odour, ammonia and VOCs) are relatively high, the peak emission flow rates are relatively low (62 Nm³/hr for stack 1 and 221 Nm³/hr for stack 2. Thus mass emission rates of these substances are not particularly high. 																																																					

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Table 11: Emission Information for Blow-off Tank Stacks

Emission Sampling Period	2002	Comment	No data has been collected since the non-compliance has been installed.			
Gas Stream Characteristics	2018	Assumptions	Assumed that concentrations in Stack 1 are zero. Only peak concentrations have been used; emission rates are zero for this source.			
Compound Class	Compound	Method	Unit	Conc (ave)	Conc (peak)	Conc (max)
Miscellaneous	Odour	AS4323.3	OU/wet/Nm ³	70020	70020	4
	Ammonia	USEPA CTM-027	mg/m ³	3102	3102	
	Particulate	Not characterised				
VOCs	Acetaldehyde	Modified USEPA MTO5	mg/m ³	274	274	
	Acetone	Modified USEPA MTO5	mg/m ³	1405	1405	
	Benzene	USEPA M18 (tube)	mg/m ³	ND	ND	
	2-butanone	Modified USEPA MTO5	mg/m ³	218	218	
	Formaldehyde	Modified USEPA MTO5	mg/m ³	6.3	6.3	
	Naphthalene	Not characterised				
	Ethylbenzene	Not characterised				
	Styrene	Not characterised				
	Toluene	USEPA M30 (VOST)	mg/m ³	2.4	2.4	
	1,2,4 Trimethylbenzene	USEPA M30 (VOST)	mg/m ³	ND	ND	
	1,3,4 Trimethylbenzene	Not characterised				
	Xylenes	Not characterised				

Table 36: Emission Information for Calciner 1 Stack

Emission Sampling Period	2002-2018	Comment	Most data are from 2005-2018. For compliance sampling, data dates to 2002. Ammonia, naphthalene, ethylbenzene, styrene, trimethylbenzene and 1,3,5 trimethylbenzene.			
Gas Stream Characteristics	2018	Assumptions				
Compound Class	Compound	Method	Unit	Conc (ave)	Conc (peak)	Conc (max)
Combustion Products	NO _x	USEPA Method 7E	mg/m ³	95	398	8.0
	CO	USEPA Method 10	mg/m ³	160	653	15.4
	SO ₂	USEPA Method 6C	mg/m ³	7.1	66	1.0
Miscellaneous	Ammonia	ECS Method 1.0	mg/m ³	2.7	5.3	0.46
	Particulate	USEPA M5 or 17	mg/m ³	33	72	4.8
VOCs	Acetaldehyde	Modified USEPA MTO5	mg/m ³	4.0	10	0.16
	Acetone	Modified USEPA MTO5	mg/m ³	2.0	10	0.16
	Benzene	USEPA M18 (tube)	mg/m ³	0.27	1.0	0.001
	2-butanone	Modified USEPA MTO5	mg/m ³	0.19	0.80	0.050
	Formaldehyde	Modified USEPA MTO5	mg/m ³	4.5	17	0.16
	Naphthalene	USEPA M18	mg/m ³	0.012	0.045	0.0024
	Ethylbenzene	USEPA M18	mg/m ³	0.0041	0.0080	0.0024
	Styrene	USEPA M18	mg/m ³	0.0071	0.017	0.0036
	Toluene	USEPA M18	mg/m ³	0.029	0.086	0.0036
	1,2,4 Trimethylbenzene	USEPA M18	mg/m ³	ND	ND	
	1,3,5 Trimethylbenzene	USEPA M18	mg/m ³	ND	ND	
	Xylenes	USEPA M18	mg/m ³	0.018	0.045	0.0050

Alcoa acknowledges uncertainties in formaldehyde concentration data. It is stated "The data set for

- Alcoa acknowledges that ECS Method 6, based on USEPA TO-5, has historically been used for formaldehyde measure for the CTs.

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	<p><i>formaldehyde includes 34 sampling results, 27 of which were non-detects. The other seven sampling results are close to the level of detection (about 0.4 mg/m³). Where a non-detect has been recorded in sampling, the data set adopts half the detection level as the estimated formaldehyde emission concentration. Adopting half detection level contributes 64% of the 0.25 mg/m³ average concentration calculated for the formaldehyde data set. The 2014 report noted that “advances in measurement / monitoring technology are required to reliably measure formaldehyde emissions from cooling towers” (Alcoa 2014).”</i></p> <p>We noted the measurement method historically used for formaldehyde (Compendium Method TO-5) measurement may not be the best available method. Method TO-5 is generally for the determination of aldehydes and ketones in ambient air and can be used to quantify formaldehyde in ambient air. USEPA method 11 (USEPA method 11A) is more appropriate method for formaldehyde measurements. The target compound for this method is specifically formaldehyde.</p>	<ul style="list-style-type: none"> Alcoa notes AQSB’s advice that USEPA method 11 (USEPA method 11A) may be a more appropriate method for formaldehyde measurements and will consider this in any future air sampling for the CTs.
	<p>The residue material remaining after the alumina has been extracted from the bauxite ore is stored at the residue storage areas (RSAs) adjacent to the refinery. The Lower Dam has also been included in the residue area assessment, even though it lies within the refinery boundary, as it is a source of fugitive VOC emissions.</p> <p>Although odour and VOC emissions from the various RSA surfaces were estimated (Table 61) and presented in the Wagerup Refinery Emission Inventory report, the RSAs have not been considered as emission sources for modelling assessment.</p>	<ul style="list-style-type: none"> All significant diffuse emission sources, including the RSA, are included in the air quality modelling.

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	Table 61: Residue Area VOC Emission Rates								
	Source	BaP Equivalents	Acetone	Acetaldehyde	Formaldehyde	2-Butanone	Benzene	Toluene	
		(µg/m²/min)							
	Lower Dam		0.25	2.8					
	ROCP		0.25	0.07	0.55				
	RSA2 – Liquor Southern		11.60	8.70	0.13	1.47	0.05	0.16	
	RSA2 – Wet Residue - North	2.0E-05	2.52	0.8	0.4	0.28	0.09	0.18	
	Super Thickener	1.38E-04	77.35	56.73	0.78	7.63	1.10	4.50	
	Cooling Pond	1.4E-04	13.24	8.9	1.5	1.97	1.24	0.9	
	Oxalate Pond		0.25	0.07	0.55				
	ROWS		0.25	0.07	0.55				
	Wet Residue	2.0E-05	2.52	0.8	0.4	0.28	0.09	0.18	
	Dry Residue 1		0.11	0.42	0.90		0.01	0.01	
	Dry Residue 2		0.42	0.05	0.08		0.01	0.06	
	Wet Sand	2.0E-05	2.52	0.8	0.4	0.28	0.09	0.18	

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Air Quality		
Community Alliance for Positive Solutions (CAPS)	A study should be conducted by Alcoa, prior to any production increases, which looks at the entirety of Alcoa emissions, how these interact in the Wagerup airshed and what impacts these have on human and environmental health.	<ul style="list-style-type: none"> • While Alcoa acknowledges CAPS suggestion, we do not consider it necessary or appropriate to carry out further emissions air quality studies or investigations beyond those required by the Part IV Ministerial conditions, including an updated Health Risk Assessment for production at 3.3Mtpa, and Part V Works Approval and licencing process for the following reasons: • The proposed Wagerup refinery expansion to 4.7 Mtpa was subject to an extensive and rigorous environmental impact assessment, including health impact assessment, through the ERMP process. Following this rigorous process involving public consultation and comprehensive input from government departments including the Health Department, conditional approval was granted for the expansion through Ministerial Statement 728 (as amended). • Importantly, since the ERMP assessment there have been two intensive ambient air quality monitoring programs carried out in the Wagerup locality in winter 2006 and winter 2009, including substantial VOC monitoring. • The monitoring programs have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. • The ambient monitoring studies support the EPA's finding in the assessment that expansion of the refinery should not pose an increased public health risk for the general community. • Alcoa's proposed amendments to MS 728 do not seek to change the fundamental principles of the existing conditions applying to expansion of the refinery. • The amendments to MS 728 primarily relate to permitting production of the refinery to be increased in increments, with an initial increase in production to 3.3 Mtpa rather than through the construction of a single-stage Third Production Unit to 4.7 Mtpa. • The proposed changes to conditions to allow for works to increase production up to 3.3 Mtpa will not result in environmental impacts greater than those assessed for the Third Production Unit revised proposal. • Alcoa considers increasing the refinery production in increments will also provide benefits in enabling emissions changes and associated mitigation

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		<p>strategies to be monitored and verified in steps as production increases, rather than in one large single-stage expansion to 4.7 Mtpa.</p> <ul style="list-style-type: none"> •
<p><u>Condition 8</u></p>	<p>Alcoa has not provided comparative figures to indicate whether the emissions reductions achieved were equivalent to the reductions required by the current Condition 8 (apart from the Cooling Tower review). This information should be provided to allow an assessment of whether Alcoa has in fact achieved the required reductions.</p>	<ul style="list-style-type: none"> • Section 3.2.3 of the S46 document shows that the predicted VOC emissions at the initially proposed expansion capacity of 3.3 Mtpa will be less than at the current approved production capacity of 2.85 Mtpa. With the abatement of the Slurry Storage (25A) Tanks VOC emissions, the estimated average emissions will be 2.84 g/s for 3.3 Mtpa compared to 2.91 g/s for 2.85 Mtpa. • Section 3.2.3 also shows that odour emissions will be effectively the same at 3.3 Mtpa as for the current approved capacity of 2.85 Mtpa. With the abatement of the Slurry Storage (25A) Tanks odour emissions, the estimated average odour emissions will be 1,442,816 OU/s at 3.3 Mtpa compared to 1,411,000 OU/s for 2.85 Mtpa. • Given the Slurry Storage (25) Tanks are one of the more intense odour sources from the refinery, and air quality modelling has shown this source to present a higher potential for odour impacts, it is expected the abatement of the Slurry Storage (25A) Tanks odours will reduce the overall potential for odour amenity impacts from the refinery.
	<p>Alcoa has stated that particular emission reduction measures that were originally proposed (such as the use of fin-fan cooling) are not required due to the downgrade of the cooling towers as an emissions source. However, as the implementation of those measures would presumably result in even lower emissions, a more complete explanation is required as to why those further reductions were considered unnecessary or impracticable.</p>	<ul style="list-style-type: none"> • The proposed changes to condition 8 do not change the fundamental requirement of the condition, that Alcoa must demonstrate best practice pollution control measures are applied to any future expansion works. Therefore, this condition will still require that all practicable measures must be implemented to minimise emissions. • The specific emissions reductions listed in the existing condition 8 were based on proposed expansion of the refinery in one stage to 4.7 Mtpa and refinery and emissions knowledge at the time. • Section 3.2.3 of the S46 document and Section 4 of Appendix 3 set out the evaluation of VOC and odour emission abatement measures for future refinery expansions and the rationale for amendments to the list. As indicated, the principle of ensuring best practice pollution control is maintained. • Proposed amended conditions 8-1 and 8-1A require Alcoa to prepare Detailed Design Reports (DDR) (to be submitted with Works Approval

Submitter	Submission and/or issue	Response to Comment						
		<p>applications) to demonstrate best practice pollution control for future expansions to the refinery.</p> <ul style="list-style-type: none"> • With the application of best practice pollution control as proposed in amended condition 8-1, VOCs emissions for a production of 3.3 Mtpa will be less than for the current approved refinery capacity of 2.85 Mtpa, and odour emissions will be effectively the same. • The implementation of Independent Design Review Team (IDRT) as part of the Procedures to Ministerial Statement 728 (MS 728), administered by the DWER, will help to ensure condition 8 is met. 						
	<p>It cannot be ascertained whether the data used by Alcoa to support the proposed changes (which appear to be derived from internal Alcoa monitoring and studies) have been subject to peer review or independently audited. We consider it critical that all information used to support Alcoa's findings be independently reviewed and verified.</p>	<ul style="list-style-type: none"> • Alcoa agrees that subjecting the DDRs required by conditions 8-1 and 8-1A to independent peer review will add extra rigour and increase confidence that expansion works will meet design emission targets. • This independent review will be undertaken by the Independent Design Review Team (IDRT), administered by the DWER, which is a requirement of the Procedures to Ministerial Statement 728 (MS 728). 						
	<p>Alcoa's Cooling Tower Review plays a significant role in the justification of this amendment, on the basis that cooling towers which were previously considered to contribute 13% of refinery Volatile Organic Compound (VOC) emissions and 25% of odour emissions should now be treated as insignificant. It is unclear whether the Cooling Tower Review has been peer reviewed or independently assessed, which – given its importance – should be the case.</p> <p>The importance of peer review of Alcoa data is underscored by an independent assessment provided by Airlabs Environmental Pty Ltd of the VOCs figures supplied by Strategen-JBS&G (Alcoa 2019, Appendix 1) in support of Alcoa's application, which casts doubt over the veracity of the data.</p> <p>The Strategen-JBS&G document quotes 2.9 grams per second (g/s) as the annual average VOC emission rate from the refinery point sources at 2.85 Million tonnes per annum (Mtpa) of production (p. 17). Anecdotally, a car</p>	<ul style="list-style-type: none"> • Proposed amended condition 8-4 would provide the CEO the discretion to require the DDR for any future expansion to be subject to review by an IDRT. The DDR must set out the 'base emission rates' and 'design emission targets' for the major sources. Therefore, base emission rates and design emission targets can be peer reviewed under the conditions if required. • It should be noted that initial Emissions Inventory for the Wagerup refinery was subject to peer review as part of the ERMP process and found to be an acceptable basis for approval for expansion of the refinery to 4.7 Mtpa. • The conditions of approval required "twelve additional months of base case emissions rate data for key sources" with key sources defined as the "liquor burner, calciners, 25A tank vents, 35A tanks, 35J tanks and cooling towers". The Table below shows the extensive additional monitoring of these sources since the 2005 ERMP. <table border="1" data-bbox="1256 1329 1980 1449"> <thead> <tr> <th data-bbox="1256 1329 1467 1378">Source</th> <th data-bbox="1467 1329 1729 1449">No. sampling runs ERMP (pre 2005)</th> <th data-bbox="1729 1329 1980 1449">No sampling runs 2005 -2018</th> </tr> </thead> <tbody> <tr> <td data-bbox="1256 1378 1467 1449"></td> <td data-bbox="1467 1378 1729 1449"></td> <td data-bbox="1729 1378 1980 1449"></td> </tr> </tbody> </table>	Source	No. sampling runs ERMP (pre 2005)	No sampling runs 2005 -2018			
Source	No. sampling runs ERMP (pre 2005)	No sampling runs 2005 -2018						

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	<p>park has VOC emissions in excess of 2.9 g/s. Not only does the figure exclude various emission sources and ignore the fact that most VOC emissions at the Refinery are fugitive and thus not stack emissions, the figure strikes as a gross under-estimation of real Refinery emissions, which Airlabs Environmental Pty Ltd have estimated to be between 20,000-30,000 g/s.</p>		<table border="1"> <tr> <td data-bbox="1261 181 1464 233">Liquor burner</td> <td data-bbox="1464 181 1727 233">13</td> <td data-bbox="1727 181 1980 233">67</td> </tr> <tr> <td data-bbox="1261 233 1464 316">○ VOCs ○ odour</td> <td data-bbox="1464 233 1727 316">7</td> <td data-bbox="1727 233 1980 316">67</td> </tr> <tr> <td data-bbox="1261 316 1464 367">Calciners</td> <td data-bbox="1464 316 1727 367">46</td> <td data-bbox="1727 316 1980 367">261</td> </tr> <tr> <td data-bbox="1261 367 1464 450">○ VOCs ○ odour</td> <td data-bbox="1464 367 1727 450">35</td> <td data-bbox="1727 367 1980 450">264</td> </tr> <tr> <td data-bbox="1261 450 1464 501">25A Tanks</td> <td data-bbox="1464 450 1727 501">5</td> <td data-bbox="1727 450 1980 501">46</td> </tr> <tr> <td data-bbox="1261 501 1464 584">○ VOCs ○ odour</td> <td data-bbox="1464 501 1727 584">5</td> <td data-bbox="1727 501 1980 584">46</td> </tr> <tr> <td data-bbox="1261 584 1464 635">35A Tanks</td> <td data-bbox="1464 584 1727 635">3</td> <td data-bbox="1727 584 1980 635">29</td> </tr> <tr> <td data-bbox="1261 635 1464 718">○ VOCs ○ odour</td> <td data-bbox="1464 635 1727 718">0</td> <td data-bbox="1727 635 1980 718">28</td> </tr> <tr> <td data-bbox="1261 718 1464 769">35J Tanks</td> <td data-bbox="1464 718 1727 769">3</td> <td data-bbox="1727 718 1980 769">70</td> </tr> <tr> <td data-bbox="1261 769 1464 852">○ VOCs ○ odour</td> <td data-bbox="1464 769 1727 852">0</td> <td data-bbox="1727 769 1980 852">64</td> </tr> <tr> <td data-bbox="1261 852 1464 903">Cooling towers</td> <td data-bbox="1464 852 1727 903">24</td> <td data-bbox="1727 852 1980 903">20</td> </tr> <tr> <td data-bbox="1261 903 1464 986">○ VOCs ○ odour</td> <td data-bbox="1464 903 1727 986">3</td> <td data-bbox="1727 903 1980 986">8</td> </tr> </table>	Liquor burner	13	67	○ VOCs ○ odour	7	67	Calciners	46	261	○ VOCs ○ odour	35	264	25A Tanks	5	46	○ VOCs ○ odour	5	46	35A Tanks	3	29	○ VOCs ○ odour	0	28	35J Tanks	3	70	○ VOCs ○ odour	0	64	Cooling towers	24	20	○ VOCs ○ odour	3	8	<ul style="list-style-type: none"> <li data-bbox="1104 1034 2143 1200">• The 2018 Emissions Inventory (2018 EI) provides a substantial basis for setting base emission rates for the refinery and the design emission targets for the expansion works to 3.3 Mtpa. The extent of emissions data in the inventory is significantly beyond that which would normally be collected to characterise and quantify emissions from an industrial facility. <li data-bbox="1104 1222 2143 1452">• As Alcoa has not been provided with the basis for Airlabs Environmental Pty Ltd estimate that VOC emissions from the refinery are 'between 20,000-30,000 g/s' it is difficult to validate, however based on published industry data, it appears high. An emission rate of 20,000-30,000 g/s equates to an annual emission of 630,000 – 950,000 t/year. This is significantly higher than the estimated mean total VOC emission of Australian alumina refineries of around 180,000 kg/year (ie 5.7 g/s) and range of 17,000-400,000 kg/yr 		
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		<p>(that is 0.5 – 12.7 g/s) (Queensland Government Environmental Protection Authority, 2010)</p> <ul style="list-style-type: none"> The projected VOC emission rate of 2.9 g/s (91,000 kg/yr) for refinery point sources is consistent with estimated emissions from other alumina refineries both within Australia, and internationally. VOC emission rates for diffuse sources are presented in the 2018 EI. As shown in the ERMP, total diffuse source VOC emissions are about half of the refinery point source emissions.
	<p>In relation to odour, both calciners and cooling towers are named as the principal emission sources. Yet, there are numerous critical emission source points not reported by Alcoa, which include:</p> <ul style="list-style-type: none"> Liquor burner 50B tank vent Slurry storage tank 25A Calciner # 4 Low Volume Vents (LVV) Oxalate kiln Residual storage areas (RSA) Dust Particulate Matter (PM) 2.5 or less, both from the refinery and RSAs Dioxins from the digesters <p>Fugitive emissions from the cooling ponds and the southern part of the Refinery.</p>	<ul style="list-style-type: none"> As set out in the Appendix 1 of the S46 document, all significant emission sources are included in the 2018 EI. Table 4 sets out the sources not included and reasons why. The 2018 EI includes estimated emissions for diffuse sources including the RSA. Monitoring and reporting of emissions from the refinery is carried out in accordance with the Part V licencing conditions.
	<p>The Wagerup Winter Study by the Air Quality Branch of the Department of Water and Environmental Regulation (DWER) (formerly Department of Environment and Conservation (DEC)) (2006) revealed possible underestimates in Alcoa's emission inventory as refinery emissions containing up to 260 chemicals were found to be lingering close to the ground for up to 18 hours within seven km from the refinery. The study notes that all emission sources should be included in audit reports, especially due to their potential impacts on human and environmental health. Importantly, the liquor burner was not operating during the Wagerup Winter Study despite</p>	<ul style="list-style-type: none"> A key issue at the time of the ERMP assessment was that there had been only limited ambient air quality monitoring in the locality of the Wagerup refinery, particularly for VOCs. Two intense ambient air quality monitoring programs have since been carried out in winter 2006 and winter 2009, including substantial VOC monitoring. The monitoring programs have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. There are some short-term elevations in the concentration of some compounds including NOx and acetone that are attributable to the Wagerup refinery, however, the concentrations measured during these events are low and

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	<p>being a critical emission source for VOCs and Polycyclic aromatic hydrocarbons (PAHs), which - as shown by Alcoa in-house documentation - the company has long had difficulties controlling. As argued by Jones et al. (2014, p. 626), "VOC release is a primary concern due to potential health effects for on-site staff, being predominately short-term sensory irritation, and odour problems perceived by residential communities located nearby." The authors further note that VOCs are "difficult to manage, as there are no readily implementable capture procedures, and VOCs can be released at various stages of the process", underscoring the importance of monitoring and auditing of all emission sources.</p> <p>CAPS acknowledge that air quality follow-up studies were conducted such as the Wagerup 2009 Air Quality Study by DEC (2011); in these studies Doppler Lidar technology was not utilised, however, which is critical for the capture of emission plumes close to ground level. It is our understanding that the DWER (formerly DEC) has Lidar technology at its disposal, and we therefore wonder as to why dated and less accurate Proton-transfer-reaction mass spectrometry (PTRMS) technology has been used instead.</p> <p>In relation to VOC emissions and odour, CAPS (2014) already noted in its appeal to Alcoa's Proposed VOC Amendments to Works Approval - W5391/2013/1 Wagerup Alumina Refinery that "[o]dour is a significant factor for the [...] Refinery and [that] available data on odour is outdated and many changes have occurred on site since 2008". Odour cannot be directly attributed to VOCs production, operational data from the calcination facility are unreliable, and there is no quantitative assessment of odour emissions for the facility and its ambient impact.</p>	<p>substantially below levels which would normally cause odour nuisance. For example, the maximum concentration of acetone recorded during the studies was 10 parts per billion (ppb) compared to a health Effects Screen Level of 2,500 ppb (DER 2009). The maximum one-hour NO₂ level recorded was around 20 ppb compared to the NEPM health standard of 120 ppb (DER, 2009).</p> <ul style="list-style-type: none"> • The ambient monitoring studies undertaken since the ERMP support the EPA's finding in the assessment that expansion of the refinery should not pose an increased public health risk for the general community. • With respect to odour, substantial measurements of odour emissions have been undertaken of all major refinery sources. In total some 500 odour measurements have been made. • As shown in Figure 4 of the S46 document, measured odour levels have decreased significantly for the Calciners, which are the largest source of odour emissions. • With the abatement of the Slurry Storage (25A) Tanks odour emissions, odour emissions will effectively remain the same as part of the expansion to 3.3 Mtpa. • While there has been a small increase in production at the refinery from about 2.41 Mtpa in 2005 to 2.63 Mtpa in 2018, the Bayer refining process remains unchanged.

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	<p>Emissions remain a sensitive issue with communities surrounding the Refinery, especially as it relates to VOCs and aromatic hydrocarbons, which have been the subject of community complaints since the later 1990s. In particular, health impacts from the Refinery have been central to community concerns. These were vindicated by the findings of the Yarloop Community Clinic (Cook 2003), the Wagerup Medical Practitioners' Forum (Holman 2002; Holman et al. 2005), and the Wagerup and Surrounds Community Health Survey (Holman 2008). The various health reports spoke of an association between community health issues and the Refinery and supported measures to limit exposure via emission reductions and the creation of a buffer zone; yet to date, no systematic health study has been conducted.</p>	<ul style="list-style-type: none"> • Employee and community health is important to Alcoa and we have undertaken significant work over many years to ensure our operations are safe for employees, neighbouring communities and the environment. • Numerous air quality research studies by Alcoa and independent experts, including the CSIRO, university researchers, independent consultancies and government departments, have shown our operations are in keeping with Australia's strict environmental guidelines and our sites and their emissions are safe for our employees and communities. Much of this has been summarised in a peer-reviewed scientific publication (Donoghue & Cullen 2007). • Wagerup Refinery undertook a HRA in 2005 for the expansion of Wagerup Refinery to 4.7 Mtpa. The HRA considered the potential health risks associated with a baseline (2.41Mtpa at 2005) and an expanded refinery emissions scenario. Based upon the results of the health screening assessment it can be concluded that: <ul style="list-style-type: none"> • The potential for emissions from the existing or expanded Wagerup refinery to cause acute health effects is low and is primarily driven by the particulate emissions from the RSA and oxides of nitrogen emissions from the refinery; • The potential for emissions from the existing or expanded Wagerup refinery to cause chronic non-carcinogenic health effects is very low; and • The potential for emissions from the existing or expanded Wagerup refinery to contribute to the incidence of cancer based on inhalation exposure is below USEPA <i>de minimis</i> threshold of one in a million (i.e. 1×10^{-6}) at all of the residential receptors considered. • The HRA was peer reviewed by Dr John Bisby. • The HRA and the peer review can be found on Alcoa's website: https://www.alcoa.com/australia/en/sustainability/health-wellbeing.asp • To provide stakeholders, including local communities, with further confidence that the refinery is safe, a revised Wagerup HRA for 3.3Mtpa will be conducted as part of the S46 review process. This too will be independently reviewed via a process administered by the EPA and shared publicly.

Submitter	Submission and/or issue	Response to Comment
		<ul style="list-style-type: none"> • The Wagerup HRA of 2005 did not show cause for concern with regard to short-term health risks or long-term health risks including the risk of cancer. Similar results have been noted at other alumina refineries where HRAs have been conducted (Donoghue & Coffey 2014). • The Healthwise research program is conducted by independent researchers at Monash University and the University of Western Australia. There is also an international advisory board, which includes eminent occupational epidemiologists from the UK and the US, union representatives and Alcoa representatives. The cross-sectional and inception cohort studies of respiratory health have been completed and published in the peer reviewed scientific literature. The ongoing cancer incidence and mortality study has also been published in the peer reviewed scientific literature. A further update is expected in 2020 with publications to follow. The cohort is reaching maturity with 78% of the 6900 current and former employees having started work at Alcoa over 30 years ago. With the exception of historic asbestos related cases (which were not from Wagerup), the Healthwise studies have not shown significant health impacts attributable to working at our mines and refineries, including the residue areas.
	<p>In relation to cancer, the number of reported cases in the communities surrounding the Refinery strike as alarming. In 2004, Department of Health (DoH) identified 337 cancer cases in the Harvey-Yarloop area and the DoH's Cancer Statistics (2002-2016) show a total of 728 cancer cases for Cookernup, Hamel, Harvey, Waroona and Yarloop. Overall, between 1998 – 2016, 1134 cases were identified in a population of 10000 (These figures do not include people who have moved away, deceased individuals or contractors working for Alcoa). The Wagerup and Surrounds Community Health Survey in June 2008 (Holman 2008) showed that Cookernup had cancer rates double the state average. Shine Lawyers registered 140 cancer cases for planned litigation in 2007, and CAPS also maintained a log of 166 cancer cases in these areas between 2009 and 2019. Efforts are currently underway between CAPS, WA Cancer Registry and the DoH to explore pathways for the</p>	<ul style="list-style-type: none"> • The Wagerup and Surrounds Community Health Survey (Telethon Institute for Child Health Research / UWA 2008) found self reported cancer was no higher in Waroona or Hamel/Wagerup/Yarloop than in the State of Western Australia. In Cookernup self reported cancer was higher than in the State of Western Australia but the survey report noted “this finding was of borderline statistical significance”. The report also stated “Figures released by the Western Australian Cancer Registry (Threlfall et al, 2004, 2008) showed no difference in cancer incidence between either the Waroona Statistical Local Area (SLA) or the Harvey Part B SLA and Western Australia overall between 1998 and 2006. These findings suggest that the elevated adjusted odds ratio for reported cancer in Cookernup may be a statistical artefact and not indicative of a higher risk of cancer in the region.” It is important to note that the Western Australian Cancer Registry data is based on mandatory notifications of cancer by medical practitioners rather than self-reports. • It is also important to note that with the exception of historic asbestos related cases (which were not from Wagerup) the Healthwise cancer incidence and mortality study has not found increased rates of cancer attributable to working in Alcoa's mines and refineries. If refinery emissions were to cause

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	<p>joining to the different cancer data sets with a view to fill data gaps in the Cancer Registry, to eliminate double counting and to ascertain the statistical significance of the number of cases. Again, it is CAPS view that the prevalence of cancer cases in communities surrounding the Refinery require further investigation.</p>	<p>cancer in the community you would expect to see increased rates of cancer in employees attributable to working in our mines and refineries, but we do not. So, the results of Healthwise complement the results from the HRA – indicating no cause for concern with regard to cancer for employees or the community.</p>
	<p>Despite the recognised health risks associated with alumina production for both workers and nearby communities (see Musk et al. 2000; Survey Research Centre 2001), these continue to be downplayed and denied by Alcoa (see Cullen 2002; Donoghue & Cullen 2007), no systematic health study has been conducted to date, and work undertaken thus far (e.g. Healthwise 2004) has been both incomplete and insufficiently independent of Alcoa (Croft 2005). The need for such a study is stressed further by the health impacts that are likely to be caused by the RSAs, which arguably are the most hazardous aspect of the Refinery's operations.</p>	<ul style="list-style-type: none"> • Further to the comments made above regarding existing health studies, a revised Wagerup HRA for 3.3Mtpa will be conducted as part of the S46 review process to provide stakeholders, including local communities, with further confidence that the refinery is safe. The HRA will include emissions from the RSAs. This too will be independently reviewed via a process administered by the EPA and shared publicly.
	<p>Under existing conditions, Alcoa is under the requirement that production increases will not lead to increases in particulate emissions from the RSAs. Based on the evidence presented below, CAPS questions Alcoa's ability to control RSA emissions at current levels of production, let alone under scenarios with production increases. At present, the Refinery produces approximately 5 Mtpa of toxic waste, which is being pumped to the RSA. The waste is a by-product of the Bayer process, which concentrates and compounds heavy metals, radiation, uranium, thorium, caustic, etc, making it a dangerous cocktail not only for contamination of groundwater but also the air in the form of dust particles (PM 2.5 or less). CAPS contends that there are fundamental design problems with the RSA, which will become more problematic with increases in production in relation to particulate emissions but also other environmental aspects. These inter-related design problems, which are raised in sequence below, relate to</p>	<p>The Residue Storage area is subject to detailed management to minimise emissions, as described in the Long Term Residue Management Strategy (LTRMS). The 2017 Wagerup LTRMS can be located on the Alcoa website. https://www.alcoa.com/australia/en/pdf/2017-wagerup-refinery-ltrms.pdf</p> <p>a) Waste stacking process: Alcoa plans construction activities and regularly monitors the ability to maintain storm attenuation to ANCOLD standards. ANCOLD are recognised by government and industry bodies as the accepted standard for water management. DMIRS undertook a high impact audit of the Wagerup tailings facilities in February 2019 and acknowledged Alcoa's compliance to ANCOLD standards.</p> <p>The Alcoa Wagerup tailings facility is audited annually by a third-party geotechnical expert. This audit reviews, amongst other aspects, the stability of the tailings dams based on geotechnical investigations, industry best practices and visual observations. A copy of this annual audit report has been submitted to DMIRS for review.</p> <p>b) RSA height</p>

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	<p>a) the waste stacking process, b) height of the RSAs c) lining of the RSAs and d) dust control.</p> <p>Waste stacking process: Alcoa (2012) describes its waste storage technique as ‘dry stacking’. The pre-thickened residue mud is deposited and allowed to solar dry to at least 65% solids such that it cannot liquefy and flow outside the RSA. Yet, according to expert advice obtained from the Center for Science in Public Participation, this technique does not resemble dry stacking as this typically requires a water content of 5%-15%. Tailings with 65% solids and 35% water are still near saturation and are likely to flow, especially given the risk of precipitation infiltrating the area over time and portions of the dried mud re-saturating. This increases the likelihood of dam failure in situations such as a 1-in-100-year, 72-hour storm event. As the refinery is intended to operate over at least another 25 years, the probability of exceeding the RSA design in a 1-in-100 event over 25 years is 22%, which CAPS contends is too high. Under future global warming scenarios, a 1-in-200- year storm event should be considered possible (see IPCC 2018), and tailings cells should therefore be able to withstand the Probable Maximum Event; a requirement current RSA design clearly does not meet.</p> <p>Similar problems are acknowledged by Alcoa (2010) staff in relation to its Run Off Water Storage (ROWS) pond capacity, which is deemed to be “insufficient ... to store a 1% wet year” (p.4). Overall, pond capacity [was found to be] insufficient for future requirements” (p. 3). Further, Alcoa’s RSA impoundments are upstream-type dam constructions, the type most susceptible to failure as the upstream lifts are built on dried muds, which typically retain water. The issue of possible RSA failure is compounded further by the stacking height of the RSAs.</p> <p>RSA height:</p>	<p>The Alcoa Wagerup tailings facility is audited annually by a third party geotechnical expert. This audit reviews, amongst other aspects, the stability of the tailings dams based on geotechnical investigations, industry best practices and visual observations. A copy of this annual audit report has been submitted to DMIRS for review. All greenfield construction activities are fully engineered as per the requirements of the DWER works approval process. All upstream lifts on RDA’s are constructed to design and forms part of the third party geotechnical audit.</p> <p>Alcoa Wagerup operates under strict environmental licence conditions, including conditions on the monitoring and control of dust emissions. These licence conditions drive processes and systems that result in meeting our internal targets which are a factor more stringent than the licence condition.</p> <p>c) RSA lining Alcoa complies with the ground water management and monitoring plan as documented in the Water Operating Strategies which form part of the RIWI Act licences.</p> <p>Prior to the use of GCL liner at the Pinjarra Refinery, extensive testing was conducted of the compatibility of the liner with Alcoa’s tailings and the typical ground conditions under the RSA’s. These test results were submitted as part of the works approval.</p> <p>d) Dust Control Alcoa Wagerup regularly monitors available water sources for the sprinkler network. Inventories are modelled under a range of climate conditions to enable Alcoa to maintain minimum inventories. Alcoa obtains water via licensed water sources or purchases water which is fit for industrial use.</p> <p>The Wagerup LTRMS (2017) provides a detailed discussion of the results of the residue dust study and health risk assessment. A dust study was conducted from 2005 – 2006 with key conclusions being:</p> <ul style="list-style-type: none"> • There is very low PM_{2.5} fraction in RSA dust. PM_{2.5} emissions from the residue areas are well below advisory criteria and not an issue of significance;

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	<p>According to Alcoa (2005; 2011) current RSAs covers approximately 607 hectares (ha) (this excludes RSA 9, which only became operational in 2013 and comprises nine RSAs designated RSA 1 through RSA 9, Run off collection pond (ROCP) 1 and 2, a Cooling Pond for process water cooling, a refinery ROWS Pond and two freshwater Detention Ponds (DP) 1 and DP2). Infrastructure at the residue area also includes a mud thickener, pumping equipment and offices. In their 25-year residue storage plan, Alcoa refer to an initial waste stack height of 45 metres (m), that was eventually to be raised to 60 m (p.10). It is our understanding, however, that since approval has been given to a stack height of 80 m. Analysis by the Center for Science in Public Participation suggests that a) the stability analysis is dated as it was carried out in 1991 (p. 24) also assuming a lower stack height and b) that increased stack height adds pressure on the strata the dam is built on, raising the possibility of leakage (see below) and dam failure. In this regard, CAPS also notes with alarm that by Alcoa's (2007) own admission "[d]esign guidelines for common projects such as RDA, Cooling Pond, ROWS pond construction have not been documented to ensure best practice standards are implemented. Increased stack height increases further existing stability problems for the RSA structure. Moreover, production increases (gradual or otherwise) will lead to increases in production residue, which is liable to increase the spatial extent of the RSAs as Alcoa will be unable to compensate waste volumes with increased stack height alone. "Alumina production is predicated by the storage of residue", which explains why Alcoa has ongoing "drying area requirements" and is therefore planning further extensions beyond RSA 9 (Alcoa 2010b, p. 5). Each expansion adds around 50 ha to the RSA area (not accounting for areas used for ROCP, etc.), meaning that an eventual doubling in production will result in the approximate doubling of the RSA area (i.e. > 1000 ha). This in turn will result in a</p>	<ul style="list-style-type: none"> • Use of up-wind and down-wind TEOMS worked well and indicated that the RSA can contribute the majority of TSP and PM10 during 1-hour and 24-hour dust events, but is a much smaller contribution to annual average concentrations and to PM_{2.5}; and • The best individual chemical marker for residue dust appears to be the trace element thorium, which though present at very low concentrations, is relatively easy to analyse for. <p>In 2008, an HRA was conducted for the Pinjarra Residue area and considered inhalation exposure of substances that include PM₁₀, and the metals arsenic, selenium, manganese, cadmium, nickel, mercury, chromium, beryllium, lead and vanadium.</p> <p>The results of the HRA reinforced that Alcoa's operations are safe for both our employees and neighbouring communities.</p>

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	<p>dramatic increase in the RSA surface area and thus exacerbate existing problems with dust control and particular emissions from the RSAs.</p> <p><u>RSA Lining:</u> Leakage is a major concern in connection with the storage of toxic waste. In relation to the RSAs, stack height was identified earlier as a contributor to leakage. Poor liner integrity and chemical reactivity can also contribute to leakages. Alcoa (2011) communications reveal that some clay liners (e.g. ROCP 1) have already been compromised reportedly in response to upward groundwater pressure with leakage confirmed by contaminated groundwater samples 100 m beyond the parameters of the RSAs. Leakage and resultant groundwater contamination have also been confirmed by a number of independent reports to Alcoa (e.g. Neild Consulting 2003; Peter Clifton & Associates 2008). Of particular concern is the high alkalinity of contaminated groundwater as it can result in the mobilisation of metals naturally occurring in the soils. Further, Alcoa's use of Geosynthetic Clay Liners (GCL) for residue disposal is problematic as there is "currently no data on the long term (beyond 5 years) field integrity of GCLs in a high alkalinity (pH 12 and above) environment" (Alcoa 2009, p. 4), and salinity is reported to adversely affect GCL performance" (p. 10). The risk of exposure to saline waste water is increased further through the "25-35 Mega litres per annum (Ml/pa) of effluent discharge" from the Alinta Cogeneration Facility (Sinclair Knight Merz 2006, p. 20), which is prone to impact on the integrity of both synthetic and clay liners.</p> <p><u>Dust Control:</u> It is widely recognised that the production of alumina from bauxite leads to the generation of hazardous waste (see Jones et al. 2014). Naturally occurring elements (e.g. radioactive materials) present in</p>	

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	<p>bauxite will concentrate in the Bayer process and tend to petition to bauxite residue (Priest & O'Donnell 1997). Residues stored in RSAs are thus to be regarded as toxic waste containing high concentrations of materials such as Mercury, Arsenic, Uranium, Thorium, Radium, Cadmium, Beryllium and many others. Beyond heavy metals, RSAs are also a rich source of PAHs and dust (PM 2.5 and smaller). In this regard, the study by D'Angelo et al. (2009) highlights the risks of carcinogen absorption from dust particles of 50 micrometre (μm) diameter. Dust from the RSA surface area, as suggested by independent expert advice received, can be as small as $1\mu\text{m}$, approximately 1/50th of the size of the particles studied by D'Angelo et al. (2009). This suggests that all previous measurements of airborne carcinogens emitted into the community are likely to be gross underestimates and that the real dose received by local residents is liable to be much higher than previously stated by Alcoa (2005). Alcoa has a poor track record on dust suppression and been facing Court on three separate occasions for pollution events from the RSAs, events the company euphemistically terms 'dust excursions'. Alcoa's dust suppression relies heavily on the use of sprinklers (Alcoa 2008b, p.11), and over the years the company has purportedly undertaken various upgrades to the sprinkler system. Notwithstanding, numerous dust events have since been recorded by CAPS members, and footage has been submitted to the DWER for further investigation. The use of sprinklers for dust suppression is problematic in terms of a) their effectiveness and b) their water intensity, as has been acknowledged by Alcoa (2008b, p.11) staff in-house: <i>The Environmental Review and Management Program (ERMP) approval dictates the ministerial conditions of no increase in emission particulates while the emission model prepared for Full WG3 in 2007 predicted increase in emission based on the input, assumptions, and methodology applied. The efficiency of the sprinkler system is depending on water</i></p>	

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	<p><i>availability. The drying trend and the predicted reduction of rainfall in the future will lead to difficulty in securing reliable water supply.</i></p> <p>The insufficiency of Alcoa's dust control measures formed the basis of CAPS' (2011) appeal to the Environmental Assessment Report on RSA 9 works at Alcoa Wagerup, which also raised questions over water consumption in this regard (see also Condition 12 – Water Use). Overall, we maintain that in light of current inadequacies an extension of the RSA area is unacceptable. Expert evidence presented to the Senate's Community Affairs Reference Committee (Commonwealth of Australia 2013, p.9) suggests that "there is no safe level of exposure that does not cause some level of harm" and that it is clear that 'fine particles', PM2.5 impose great health and cost burdens on communities. Further, "[t]he committee heard evidence ... that the monitoring requirements in operating licences are often insufficiently specific to ensure that point-source monitoring is conducted in places that will accurately represent community exposure" and that "there is an overreliance on industry to provide information, and that is frequently far from adequate and far from transparent". CAPS echoes this assessment for its sees the problems surrounding the Refinery as evidence of failed industry-self regulation.</p> <p>Problems associated with dust emissions are not new, and calls have been made repeatedly over the last 15 years for thorough investigations into fine particle emissions from the RSA, emission control, and the impact of emissions on community health not only by CAPS but also the Standing Committee on Environment and Public Affairs (2004), the DoH (2005), and the CSIRO (2004). Modelling used for the ERMP (Alcoa 2005) was not considered robust by the DoH (2005), yet it continues to provide the basis for Alcoa's public claims of reduced dust emissions from the RSA. Alcoa (2011) has since asserted that dust impacts will be reduced further by way of</p>	

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	<p>extending the RSA based on dated and unverified estimates and bold inferences, rendering the real prospect of harm reduction improbable. In general, the logic used by Alcoa seems to suggest that the greater the facility, the less impact it is likely to have. At the same time, this logic is contradicted in Alcoa’s refinery VOC an odour outlook (2019, Appendix 3, p.21), which makes plain that an “increase to 4.7 Mtpa production rate is expected to produce an increase in VOC and odour emissions” in part owing to the then required increase to 700 megawatts (MW) in cogeneration capacity, which is expected to lead to a rise – among other things - in PM2.5 emissions (Sinclair Knight Merz 2006). Further, it is entirely uncertain at this stage how “the specific challenges” associated with such an increase will be dealt with as this will require a “detailed investigation of large refinery sources ... as well as selection of future production and abatement scopes” (Alcoa 2019, Appendix 3, p.21).</p>	
	<p>The National Pollutant Inventory data show an increase in mercury emissions at the Refinery, which warrant further investigation and public reporting.</p>	<ul style="list-style-type: none"> • This matter will be addressed in information provided as part of the Works Approval application and in the risk-based review of the operating licence L6217/1983/15 being conducted by DWER.
	<p>Based on the above points, CAPS provides the following recommendations:</p> <ul style="list-style-type: none"> • Thorough audit and verification of all Refinery emissions and emission sources is essential. These should be assessed holistically as part of Cumulative Impact Assessment before any production increases are approved. Such an assessment should include all refinery operations as well as the RSA. Overall, Alcoa is yet to present a robust and verified set of figures for its emissions and odour to make a credible case for mission reduction. • All assessment work should be monitored and audited independently. • The RSA design should be tested rigorously and Alcoa be required to present a credible residue 	<ul style="list-style-type: none"> • Alcoa acknowledges the recommendations by CAPS. As highlighted above. • The 2018 EI provides a substantial basis for setting base emission rates for the refinery and the design emission targets for the expansion works to 3.3 Mtpa. The 2018 EI is based on some 500 monitoring runs for both VOCs and odour for all major refinery sources. The extent of emissions data in the inventory is significantly beyond that which would normally be collected to characterise and quantify emissions from an industrial facility. • Proposed amended condition 8-4 would provide the CEO the discretion to require the DDR for any future expansion to be subject to review by an IDRT. The DDR must set out the ‘base emission rates’ and ‘design emission targets’ for the major sources. Therefore, base emission rates and design emission targets can be peer reviewed under the conditions if required.

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	<p>management strategy that addresses the risk of RSA failure, leakage and dust pollution.</p> <ul style="list-style-type: none"> • A full audit of PM2.5 and all other emissions from the co-generation facility should be conducted, together with an assessment of the impact of saline slurry on the integrity of RSA liner material. • CAPS would welcome DWER to consider the apparent increase in mercury emissions as part of the current review. Further, as stipulated in CAPS' submission to the review of Alcoa Wagerup Licence Conditions in 2017, reporting on all heavy metals and radioactive gases including Mercury, Arsenic, Uranium, Thorium, Radium, Cadmium, Beryllium, Chromium, Lead, Manganese, Nickel, Radon and Thoron should be made mandatory. • The change in the baseline emissions rate is an improvement, as Refinery emissions will now be measured against a more stringent baseline for odour than at present. 	<ul style="list-style-type: none"> • An HRA was undertaken for the refinery at the proposed 4.7Mtpa. The HRA showed that, even with the conservative approaches adopted, refinery emissions are well below levels that would cause any: <ul style="list-style-type: none"> ○ Acute health effects; ○ Chronic health effects; ○ Increased cancer risk. • The HRA is consistent with the findings of two detailed ambient air quality monitoring programs in the Wagerup locality undertaken since the ERMP assessment which have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. • A revised Wagerup HRA for 3.3Mtpa will be conducted as part of the S46 review process to provide stakeholders, including local communities, with further confidence that the refinery is safe. The HRA will include emissions from the RSAs. This too will be independently reviewed via a process administered by the EPA and shared publicly. • The Wagerup Refinery Long Term Residue Management Strategy (2017) document is designed to inform local and state governments, as well as the wider community of Alcoa's long-term management strategies and commitments for a sustainable future in residue management. It documents issues such as where future residue infrastructure areas will be located, the proposed height requirements for the residue dryings area, and how environmental risk associated with residue storage will be managed. • Alcoa is not the proponent nor owner of the Alinta Co-generation facility adjacent to the refinery. Process wastewater from the Alinta gas turbines is generated from the blowdown of the water treatment plant and the evaporative cooler. This is discharged to the Residue Storage Areas at the Wagerup Alumina Refinery where it is evaporated or reused within the refinery process.
<p><u>Condition 8-1A</u></p>	<p>The new condition removes the existing requirement for the design report to be independently peer reviewed. CAPS opposes the removal of the peer review requirement.</p>	<ul style="list-style-type: none"> • Proposed amended condition 8-4 would provide the CEO the discretion to require the DDR for any future expansion to be subject to review by an IDRT.

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<u>Condition 9</u>	CAPS welcomes the inclusion of additional investigation of techniques and approaches for measurement and assimilation of vertical wind velocity measurements into the Wagerup air dispersion model.	<ul style="list-style-type: none"> Alcoa notes CAPS' comment and supports further investigations where they are cost effective to improve the Wagerup air quality model. However, Alcoa notes that in consultation with the CSIRO and recognised competent air quality modelling consultants it has undertaken extensive work on developing and verifying the Wagerup air quality model over some 15 years. The extensive air quality model development and verification work and results of ambient air quality monitoring provide a very sound degree of confidence for assessment of any potential health impact from expansion of the Wagerup refinery.
	The proposed changes appear to soften the language pertaining to the results of the proposed dispersion model merely needing to be 'consistent with' as opposed to 'achieving' predictions presented in the ERMP (Alcoa 2005).	<ul style="list-style-type: none"> It is proposed the wording of conditions 9-2 and 9-3 be amended slightly to require demonstration that the GLCs are 'consistent with' the 2005 ERMP predicted GLCs rather than 'achieve' or 'similar to'. The term 'consistent with' enables a determination whether the GLCs predicted for expansions are congruous with the 2005 ERMP predicted GLCs having regard for the objective of meeting health standards and health risk assessment. Alcoa considers the wording 'consistent with' provides a better legal wording than 'achieves' or 'similar to' for the CEO to determine compliance with the condition.
	CAPS is concerned that the proposed data acquisition and methods employed are to be acceptable only to the CEO of DWER as opposed to be meeting to the requirements of the Minister for the Environment, on advice of the Environmental Protection Authority (EPA) and/or being acceptable to DWER.	<ul style="list-style-type: none"> Alcoa considers that the CEO of DWER has appropriate powers under the EP Act, and resources, to enable determination of compliance with the conditions.
	ERMP modelling has long been known to be problematic, and revision of Alcoa's air dispersion model is needed. There are concerns about the study design for various historical reasons as outlined previously but also in light of the fact that the ERMP provides a poor benchmark for modelling.	<ul style="list-style-type: none"> Alcoa does not consider that the proposed changes to condition 9 change the fundamental requirements of the condition. As indicated above, Alcoa in consultation with the CSIRO and recognised competent air quality modelling consultants has undertaken extensive work on developing and verifying the Wagerup air quality model over some 15 years.

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	<p>The proposed changes in the wording of Condition 9 render the condition less exacting and exclude the extent of EPA/DWER oversight. CAPS is concerned about the robustness and reliability of any future air dispersion model produced by Alcoa.</p>	<ul style="list-style-type: none"> The GLCs predicted by the air quality model are consistent with results of ambient air quality monitoring programs in the area which have shown that concentrations of pollutants from the refinery are very low and well below health standards.
	<p>Based on the above points, CAPS provides the following recommendations:</p> <ul style="list-style-type: none"> The EPA assess the suitability of the ERMP (Alcoa 2005) as a benchmark for Alcoa's air dispersion model. The proposed changes to wording pertaining a) to EPA/DWER oversight/acceptance and b) new modelling data merely needing to be consistent with predictions presented in the ERMP (Alcoa 2005) not be acceded to. Consideration be given to a study design as proposed by CSIRO (2003), which met community expectations in terms of method, process and transparency. Given the history surrounding the Refinery, the robustness of all critical data acquisition by Alcoa needs to be demonstrated to the community. 	<ul style="list-style-type: none"> While Alcoa notes the CAPS' recommendations, we view these measures as unnecessary based on the points above.
<u>Condition 10</u>	<p>The change from a management plan to a verification plan seems to imply that emission monitoring moving forward will serve the purpose of validating assumptions made in the ERMP (Alcoa 2005) about Refinery emissions.</p>	<ul style="list-style-type: none"> The proposed change to condition 10 to refer to an Air Quality Verification Plan (AQVP) rather than management plan is to reflect that the primary intent of the condition being to verify that the design emission targets for expansion works are achieved. Any requirements for on-going air quality monitoring and management associated with the refinery should be carried under the Part V licence conditions, as currently occurs.
	<p>These assumptions are poorly supported and evidenced (DoH 2005; DEC 2006; D'Angelo et al. 2009). The change in approach suggests that future monitoring will no longer serve the purpose of managing towards future emission reductions but instead to obtain measurements to support the assumptions about Refinery emissions.</p>	<ul style="list-style-type: none"> As detailed above, the change in condition to reflect a Air Quality Verification Plan (AQVP) rather than a management plan is to reflect the primary intent of the condition being to verify that the design emission targets for expansion works are achieved. This does not replace the existing Part V licence conditions for monitoring, as they currently occur.

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	<p>A shift away from point source measurement to ambient air quality measurement is problematic due to a history of ambient air quality studies that have failed to detect elevated levels of pollution exposure. CAPS see a risk in the possibility of 'strategic data collection' by Alcoa.</p> <p>Since the late 1990s, Alcoa's in-house emission monitoring has failed to meet community expectations. Data made publicly available by Alcoa over the years has routinely been found to be either incomplete, internally inconsistent, wrong or misleading and in most cases not peer-reviewed (DEC 2006; D'Angelo et al. 2009). As stated by the DoH (2005) in its review of the ERMP, "the largest weakness in the evidence presented in the ERMP is the lack of robust and defensible data".</p>	<ul style="list-style-type: none"> • The proposed changes to condition 10 do not propose a shift away from point source measurement to ambient air quality measurement. Condition 10-1 (1) requires that the AQVP include an 'emission' and 'ambient' air quality monitoring program, as appropriate, for performance verification monitoring of expansion works. • All Alcoa compliance monitoring is carried out in accordance with standards prescribed in the Part V licencing. Where monitoring is carried out beyond the licence requirements it is carried out by appropriately qualified and accredited parties.
	<p>The proposed change removes the requirement for mandatory independent peer review, both of the results (as required by the Air Quality Management Plan conditions in 10.1(3)), and the plan itself (10.2). Independent peer review of the plan would be undertaken at the discretion of the CEO of DWER. However, the peer review requirement assists in ensuring that the conditions are met and in identifying any issues or shortcomings in the measurement of operational performance. Also, the proposed change would effectively eliminate direct EPA involvement and also serve to exclude experts from the DEC and DoH.</p>	<ul style="list-style-type: none"> • Alcoa has proposed that item (3) of condition 10-1 that requires independent audit and review of the monitoring results of the AQVP be removed as it considers DWER has the appropriate expertise to do this. • Proposed amended condition 10-2 provides the CEO with discretion to subject the AQVPs required by condition 10-1 to independent peer review if required. • The DWER CEO also has the capacity to obtain advice from other government agencies, including the Department of Health, if required.
	<p>Based on the above points, CAPS provides the following recommendations:</p> <ul style="list-style-type: none"> • Alcoa be required to provide a strong rationale justifying changes from a management plan to a verification plan. Also, detailed and peer-reviewed information are needed about the nature and adequacy of proposed emission measurements. • ERMP emission data require updating as well as independent validation before it can serve as benchmark for ongoing emissions monitoring. 	<ul style="list-style-type: none"> • While Alcoa acknowledges CAPS' recommendation, we do not support these actions for the reasons outlined above. • In particular, as indicated above, proposed amended condition 10-2 provides the CEO with discretion to subject the AQVPs required by condition 10-1 to independent peer review if required and the CEO also has the capacity to obtain advice from other government agencies, including the Department of Health, if required.

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	<ul style="list-style-type: none"> Operational Performance Verification Plans be provided by Alcoa prior to an approval being obtained. Requests for a waiving the peer-review requirements should not be acceded to. The proposed amendment strikes as an attempt to limit due scrutiny of Alcoa's operations even though only scant evidence is presented that the company meets its legal and public obligations. 	
Social Surroundings		
CAPS	<p>Alcoa should commission an independent holistic community impact study to fully understand the nature and causes of community impacts stemming from the Refinery so as to improve the way in which the site is regulated as well as protect and compensate adequately affected communities.</p> <p>A holistic impact assessment should be undertaken prior to any further changes to the Refinery licence (e.g. production rate, water use, noise, and emissions), due to the interconnectedness of the impacts.</p>	<ul style="list-style-type: none"> The proposed Wagerup refinery expansion to 4.7 Mtpa was subject to an extensive and rigorous environmental impact assessment, including health impact assessment, through the ERMP process. Following this rigorous process involving public consultation and comprehensive input from government departments including the Department of Health, conditional approval was granted for the expansion through Ministerial Statement 728 (as amended). Importantly, since the ERMP assessment there have been two intensive ambient air quality monitoring programs carried out in the Wagerup locality in winter 2006 and winter 2009, including substantial VOC monitoring. The monitoring programs have shown that concentrations of pollutants in the Wagerup locality are low and well below health standards. The ambient monitoring studies support the EPA's finding in the assessment that expansion of the refinery should not pose an increased public health risk for the general community. Alcoa's proposed changes to MS 728 do not seek to change the fundamental principles of the existing conditions applying to expansion of the refinery.
	<p>The Refinery has been the responsible for over 20 years of community agitation and been the cause of much social disruption, psychological and financial harm.</p>	<ul style="list-style-type: none"> In the past 20 years the area surrounding Alcoa's Wagerup operations has experienced multiple changes in regional circumstances. Gradual downsizing of timber milling operations in Yarloop to eventual closure, abattoir closure, dairy deregulation and the impact of Alcoa's Wagerup Land Management Plan have all contributed to considerable population change, lifestyle disruption and social change in the immediate community surrounding Alcoa's Wagerups operations. Alcoa has operated to the

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		<p>Wagerup Land Management Plan (as agreed by State Government) committing to purchase and retain for the life of the refinery properties in an area referred to as Area A around its operations. Alcoa also implemented a further substantial property purchase program, referred to as the Supplementary Property Purchase Program (SPPP). This program was administered by an Independent State Government appointed Administrator and enabled any property owners outside of the existing Land Management Plan areas to also sell their properties to Alcoa if they had concerns regarding the existing refinery operations or Third Production Unit expansion. Alcoa acknowledges that this has impacted the local community and caused considerable angst for some neighbours. Pleasingly, in more recent years there appears to have been some stabilisation of the community, In fact, since the devastating fire of 2016, Yarloop has seen an increase in new homes being built in the community.</p>
	<p>Alcoa should consider noise generation from increasing raw bauxite transport on road and rail and the impact on towns along the transport routes.</p>	<ul style="list-style-type: none"> • Procedure 2 of MS 728 required the Department of Industry and Resources to establish an inter-agency working group to address potential rail noise issues associated with expansion of Wagerup refinery and condition 14 required Alcoa to participate in the review. • Alcoa remains committed to work with relevant government agencies on any practicable measures to minimise rail noise issues. • It is noted that under the proposed changes to the conditions of MS 728, the initial expansion of the refinery will be only to 3.3 Mtpa, not the maximum 4.7 Mtpa capacity approved by the statement. • Bauxite was transported by road to the Port of Bunbury for a short period in 2018. Alcoa has no current plans for this activity to recommence. No bauxite has been railed from Wagerup Refinery.
	<p>Alcoa should consider the creation of a formal 5 kilometre (km) buffer zone, as suggested by the DoH (2005) and Sinclair Knight Merz (2006) to ensure people are removed from the most affected areas near the Refinery and compensated accordingly.</p> <p>Refinery impacts have been felt unevenly across adjacent communities and also in areas further afield. As such, a 5 km buffer will only go so far in protecting people from harm, which is why CAPS has long been calling for a 10 km buffer zone, which would be in line</p>	<ul style="list-style-type: none"> • As described in section 3.2.3 of the S46 document, Alcoa has implemented substantial property purchase programs in the Wagerup locality and has now acquired a substantial area around the refinery (Figure 1 of the S46 document). • Any consideration of a 'buffer zone' around the refinery is a matter for the Government, in association with the Western Australian Planning Commission to consider. • Alcoa established an area known as Area A as part of the Wagerup Land Management Plan adopted in 2002. Alcoa now owns more than 90% of Area

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	<p>also with national guidelines for cogeneration facilities of the size required at 4.7 Mtpa production levels.</p>	<p>A which it will retain ownership of for the life of the refinery. A supporting scheme enabled property owners in Yarloop & Hamel (known as Area B) to sell to Alcoa if they no longer wished to reside in the region. These properties have then been on sold by Alcoa with more than 90% in Yarloop & Hamel now back in private ownership.</p>
	<p>Alternatively, Alcoa should consider the relocation of local communities and the establishment of a new township between Mandurah and Bunbury as proposed by CAPS in the wake of the catastrophic 2016 bushfire that destroyed much of the Yarloop township and in the absence of any government attempts to rebuild the town. The physical separation of communities and the Refinery is the safest option and one that offers potential for regional development and thriving communities.</p>	<ul style="list-style-type: none"> • Alcoa notes CAPS' comments and while ultimately this is a matter for Government to consider, Alcoa does not share this view. • In the "Waroona Complex Fire – January 2016: Report of the State Recovery Controller" 180 residents of Yarloop were surveyed on a wide range of items. In the report summary the dominant position advocated by the community was to rebuild. Requests for the town to be relocated were summarised as less than 5% of participants. • Since the 2016 Yarloop Fire more than \$12.6M has been spent on the construction of more than 54 new privately-owned homes in the Yarloop area (More than 41 of these have been rebuilds due to the fire and are predominantly in Area B of the Wagerup Land Management Plan). The Shire of Harvey, State Government and Community Group partners have invested more than \$5.19M on community infrastructure including the Yarloop Fire Station/Shire Depot (\$829K), Yarloop Community Centre. (\$2.56M), Train Station, CWA Hall, Public Amenities (\$300+K), roads, kerbing and foot path construction (this is new construction not maintenance). A further \$1.3M is being spent in the 2019/2020 financial year. The Shire also has nearly \$300K in a Yarloop Townscape Reserve Fund (provided by Alcoa) and more than \$5M held in reserve for the reconstruction of the Yarloop Workshops Precinct. All utility services (Water, Electricity and Phone) have been restored to the Yarloop community. From the 2016 fire the community of Yarloop is very much revitalised and continuing to move forward. • In 2017 the Shire of Harvey undertook the development of the Yarloop Town Development Plan. In consultation with the Yarloop community it produced a 32 page document that identified asset development, future subdivision and statutory town planning for Yarloop (Yarloop Town Development Plan, Shire of Harvey, 2017) Alcoa recommends that should the EPA require additional information regarding Yarloop's future, it consult directly with the Shire of Harvey which has been instrumental in leading the town's recovery.

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<p><u>Condition 11</u></p>	<p>The requirements of Condition 11 and the <i>Environmental Protection (Wagerup Refinery Noise Emissions) Approval 2012</i> are quite different. Condition 11 requires measures for noise control to be incorporated into the design and construction of any expansion works (through revisions to a management plan), whereas the Noise Approval requires Alcoa to carry out noise monitoring and to develop a noise amelioration plan, which is not concerned with the control of noise emissions from the Refinery, but rather with the creation of buffer zones through land purchases and the installation of noise insulation in affected residences. In other words, the two sets of requirements do not duplicate each other.</p>	<ul style="list-style-type: none"> • Alcoa agrees that the requirements of condition 11 are different to the requirements of the <i>Environmental Protection (Wagerup Refinery Noise Emissions) Approval 2012</i>. • However, Alcoa notes that all works to expand the refinery which may increase noise will require a Works Approval application under Part V of the EP Act. Section 54 (1)(c) of the Act provides that: <ul style="list-style-type: none"> 54. Works approvals, applying for, granting, refusing etc. (1) An application for a works approval shall be — (c) supported by such plans, specifications andother documents and information, including a summary thereof, as the CEO requires. • The CEO therefore has broad powers under Part V of the Act to request whatever information is required to properly assess acceptability of noise emissions from any expansion works, including modelling and verification of noise emitting element or clusters of elements associated with the works. • Alcoa therefore considers any Part IV condition simply duplicates these powers and its preference remains that condition 11 be deleted.
	<p>Alcoa should not be relieved of the obligation in Condition 11 to incorporate noise control measures into its expansion works.</p> <p>Alcoa has proposed an alternative amendment which only tweaks condition 11 to make it consistent with Alcoa's proposed new expansion strategy. CAPS has no problem with that alternative amendment.</p>	<ul style="list-style-type: none"> • Alcoa recognises that noise control measures will need to be incorporated into future expansions. • Alcoa considers that this is best addressed through the Part V Works Approval process.
	<p>It important that noise management continues to be a vital consideration of any Refinery expansion given Alcoa's commitment to noise reduction under its own Land Management Policy (Alcoa 2002) and that the company was originally granted approval for the Unit Three Expansion on the basis that there were no increases in noise (McGowan 2006).</p> <p>CAPS questions Alcoa's ability to deliver on this commitment in light of the following:</p> <ul style="list-style-type: none"> • Alcoa cannot meet its obligations under the <i>Western Australian Environmental (Noise) Regulations 1997</i>. Arguably, the company has been operating in 	<ul style="list-style-type: none"> • Alcoa agrees that noise management is an important consideration of any refinery expansion. Alcoa recognises that it must comply with the conditions of the <i>Environmental Protection (Wagerup Refinery Noise Emissions) Approval 2012</i> (as amended). DWER is currently assessing the re-application by Alcoa and associated reports submitted as part of the above approval.

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	<p>exceedance of existing noise legislation for well over 20 years (See EPA 1995). Due to difficulties with noise management Alcoa already needed to apply for a variation under Section 17 of the Refinery Regulation to increase allowable night time noise levels to 47 A-weighted decibels (dB(A)).</p> <ul style="list-style-type: none"> • the approval by government of Alcoa's variation request, according to an assessment by the Environmental Defender's Office (WA) (2015), centred on "incomplete and misleading conclusions based on the outcomes from noise studies and reports conducted on the Refinery". Alcoa data clearly suggest, particularly the Alcoa (2008) Report, that the cost of reducing offsite noise levels would disproportionate to any social benefits gained. As such, it was unrealistic to expect that there would be no further noise impacts associated with a Refinery expansion in light of the unfavourable cost-benefit analysis concerning noise controls. • Supporting information for the Wagerup Refinery Regulation 17 variation application attests clearly to the practicability concerns regarding proposed noise controls and fails to make assessment of the reasonableness of further noise controls (e.g. Alcoa n.d.). Further, in-house memoranda make plain that "noise reduction would not be able to be maintained with an expansion" of the Refinery, and a report by SVT Engineering Consultants (2008) to Alcoa also underscores that noise modelling undertaken for the ERMP was inappropriate for future assessments of the expansion project. • Alcoa continues to operate in breach of noise regulations attested to by ongoing complaints made by members of the community logged with the DWER. At the same time, Alcoa claims that there have not been any complaints over the 2017-2018 period (Alcoa 2019, Appendix 1, p.12). CAPS members have also undertaken noise monitoring and 	

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	logged noise data, which shows Alcoa's exceedance of permitted noise limits (information can be made available on request).	
	<p>Based on the above points, CAPS doesn't not support the removal of condition 11, and provides the following recommendations:</p> <ul style="list-style-type: none"> • Alcoa be required to continue noise amelioration efforts to reduce acoustic impacts from the refinery on local residents. • Increase in production will not lead to increases in Refinery noise. • Independent noise monitoring be conducted to ascertain true extent of noise pollution in the vicinity of the Refinery prior to works approval being granted to serve as baseline data for post-expansion testing. • A review of Alcoa's Land Management Plan (2002) and the noise contours it is based on should be undertaken, as this provides the basis for compensation of noise affected properties. This should be part of the licence condition moving forward. 	<ul style="list-style-type: none"> • As indicated above, Alcoa recognises that noise control measures will need to be incorporated into future expansions. • Alcoa considers that information on how noise will be managed for expansion of the refinery to 3.3 Mtpa should be provided as part of the Works Approval application. The information should: <ul style="list-style-type: none"> ii. demonstrate that noise levels will not exceed the approved levels set out in the <i>Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012</i> (as amended); and iii. evaluate any practicable measures to reduce noise levels to lower than these approved levels.
Inland Waters		
CAPS	Water usage and water contamination at Alcoa mine sites and refineries should be part of a single water licence.	<ul style="list-style-type: none"> • The locations of each of Alcoa's refinery and mining operations is predominantly in different surface and groundwater catchments and a single water licence is not viable. Alcoa is regulated in accordance to the RIWI Act for water abstraction.
	<p>The following health and environmental studies should be undertaken prior to any production increases:</p> <ul style="list-style-type: none"> • Water run-off due to impacts of land clearing; • Fluoride production and impact of water fluoridisation; • Underground stream disruptions and forest clearing impacts on water resources and wildlife; and • Impact of climate change on future water availability and impact of drier climate conditions on water 	<ul style="list-style-type: none"> • Alcoa Wagerup prepares and submits an annual water report to the DWER. Triennially a more comprehensive water report is produced which details trends and analysis of water data. Water use and potential impacts are assessed via Part V of the EP Act. • External water purchased is via the Harvey Water Irrigation Cooperative. This supply is augmented through from Wellington Dam (the most salinity affected public dam in the South West). This arrangement was put in place more than a decade ago to ensure that water supplied to industrial users by the Harvey Water Irrigation Coop would not have any negative impact on

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	competition between different water users (industry, irrigators, communities etc.).	the supply allocations made to local irrigators in the Harvey, Waroona region. This was done in recognition of a drying climate, competition between water users and working to use fit for purpose water supply.
	Alcoa should consider development of water treatment and desalination plants on-site to maximise water recycling and address water contamination.	<ul style="list-style-type: none"> • While this statement is not relevant to the S46 submission, Alcoa acknowledges water efficiency is of paramount importance to the community. It focuses where practical to use fit for purpose water sources.
<u>Condition 12</u>	The information in the section 46 (s46) Supporting Document is not very detailed and does not set out Alcoa's actual obligations under its water licences, so it is difficult to discern whether the claim in the s46 Supporting Document is accurate. This is compounded by the fact that Alcoa does not report on its actual water use and the amount for specific uses at the Wagerup refinery and the RSA.	<ul style="list-style-type: none"> • Alcoa considers that water use for the Wagerup refinery is best regulated under the <i>Rights in Water and Irrigation Act 1911 (RIWI Act)</i> and associated policies and guidelines. • Alcoa has a water licence under the RIWI Act for the Wagerup refinery which has a requirement to have an Operating Strategy which includes a section on water conservation and efficiency. • Condition 12 specifies only that the WUMP describe 'the water use minimisation and re-use practices that will be employed so as to achieve the minimum practicable water use at the refinery.' • Appendices A and B of DWER Operational Policy 1.02 – Policy on water conservation/efficiency plans (2009) provide a detailed Framework and Guidelines for development water conservation/efficiency plans. • Alcoa therefore considers any Part IV condition simply duplicates these powers and its preference remains that condition 12 be deleted. • Alcoa reports its water use annually to DWER and publicly presents this data to the Community Consultative Network (CCN) each year. The information reported includes water use at residue storage area and refinery operations.
	<p>Figures relating to water use provided by Alcoa are inconsistent and misleading.</p> <p>Alcoa provided the DWER (formerly Department of Water (DoW)) with a Water Inventory for 2014, citing approximately 10 gegalitres (GL) for total water usage at the Refinery. In 2014, alumina production at the Refinery was 2.65 Mtpa. The ERMP (Alcoa 2005, p.69) states that 9.46 GL of water are required to produce 2.35 Mtpa (excluding water use at the Willowdale mine site). The DoW confirmed that Alcoa reported a total water usage</p>	<ul style="list-style-type: none"> • The DOW correspondence (dated 11/10/2015) attached to CAPS submission (Attachment 11) states the use of more than 10 GLs of licenced water sources and non-water sources by Alcoa Wagerup in 2014. The correspondence indicates that the table provided by DOW is that of Alcoa Wagerup's reported water use in 2014, no correspondence has been provided from DOW that states 2.92 GL was the total water usage. It is noted that the volume 2.92 GL may correspond with Alcoa Wagerup and the Willowdale Mine use of licenced water sources in 2014, causing some confusion.

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	for the Refinery and the Willowdale mine site of 2.92 GL in 2014, leaving a discrepancy of an unaccounted 6.5 GL.	
	Alcoa is a participant in the Water Efficiency Management Plan Program (WEMP). A requirement of membership is Alcoa must develop their own plan as part of their commitment to the WEMP. The plan should include initiatives such as annual water savings actions and initiatives, and report the outcomes from these activities to the Water Corporation. However, this information was not available for public review at the time this submission was completed.	<ul style="list-style-type: none"> • Business customers who use more than 20,000kL of water annually are required by the Water Corporation to participate in WEMP as per the Water Corporation's website. (https://www.watercorporation.com.au/landing/internal-forms/water-efficiency-management-plan) • The Wagerup Refinery does not purchase any water from the Water Corporation and is not a participant in the WEMP.
	Under Proposed Changes to Condition (p.45) Section 7.2.1 suggests that Alcoa do not currently have a Water Use Management Plan (WUMP) in place. A comprehensive Water Management Plan should form part of Alcoa's current operations. Water use and reuse practices should form part of Alcoa's WEMP plan with consideration given to ensuring hydrological regimes and quality of groundwater and surface water are protected.	<ul style="list-style-type: none"> • As indicated above, Alcoa has a water licence under the RIWI Act for the Wagerup refinery which has a requirement to have an Operating Strategy. The operating strategy includes a section on water conservation and efficiency. • Alcoa will follow up with DWER Kwinana Peel region on finalising the Operating Strategy, including the requirements for water conservation and efficiency.
	Alumina production is very water intensive. At a production level of 2.85 Mtpa the Refinery uses around 10 GL per annum (Alcoa 2005). This figure is expected to increase above 15 GL per annum should production increase to 4.7 Mtpa, which would be the equivalent of 4.1% of Perth's total water supplied via the Integrated Water Supply Scheme networks. Further, projected water requirements and estimated available water supply by Alcoa (2005) are based on historical data and do not account for long-term reductions in rainfall in Western Australia and the overall prospect of diminished water availability.	<ul style="list-style-type: none"> • Alcoa acknowledges water efficiency is of paramount importance to the community. It focuses where practical to use fit for purpose water sources. The DOW correspondence (dated 11/10/2015) attached to CAPS submission (Attachment 11) indicates the non-licenced water sources used. These include soil moisture in the bauxite, reagents (caustic and lime) added to the process, water gathered from across the closed-circuit operation (this includes recycling of sub-surface drainage under residue storage and on-site surface rainfall at residue and the refinery) that must be captured. Ground water used is sourced from recovery bores within the refinery. This constituted more than 50% of water in 2014 and is non-potable. Water sourced externally (nearly 20% in 2014) is purchased from the Harvey Water Irrigation Coop with supply augmented through their supply system from Wellington Dam which is a non-potable source of water supply. Licenced surface water supply is sourced from smaller adjacent catchments that are not linked to the Integrated Water Supply Scheme or via seasonal pump

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		back from the Harvey Diversion drain in winter where the water has excessive nitrogen, phosphorous & potassium levels from farming activities.
	Alcoa already augment shortfalls in groundwater and surface water with scheme water, and the proposed increase in production will increase pressure on Alcoa to secure further water resources.	<ul style="list-style-type: none"> The Wagerup Refinery does not access any water supply from the Integrated Water Supply Scheme.
	<p>Several investigations confirm that aquifer contamination originates from the Refinery and RSA.</p> <p>For example, Neild Consulting (2003) reveal:</p> <ul style="list-style-type: none"> "Low concentration of residue leachate are evident in some parts of the upper superficial aquifer". "Increasing trend of m-alkalinity evident under RDA3s eastern dykes". "Evidence of damaged or poorly constructed monitoring bores. Affecting the reliability groundwater data, and increasing the risk of ground water contamination. This suggests that surface deposits may be contaminated with residue and alkali material". 3 zones of contaminated ground water identified (near building 30 (northern refinery area), Buildings 45/50 (southern refinery area and west of the hydrate stockpile). Outcomes presented in these consulting reports clearly show that alkali contaminants have permeated the shallow aquifer. <p>Further, according to Peter Clifton & Associates (2008):</p> <ul style="list-style-type: none"> "Ground water monitoring and recovery data at Building 26A in the Wagerup refinery produced 17,399 kilo litres (kL) of groundwater, and recovered an estimated 9.33 tonnes of alkali (sodium carbonate)". "Hydrogeochemistry in bore water samples collected RSA1, RSA2 and the Sand Area monitoring wells are heavily contaminated with residue leachate measured as conductivity and alkalinity. Hydrographs reveal 	<ul style="list-style-type: none"> Alcoa has undertaken investigations in accordance to the <i>Contaminated Sites Act 2003</i> in line with DWER Contaminated sites guidelines. This includes a staged investigation approach to ensure risks to human health or the environment are identified, characterised and mitigated. A comprehensive groundwater monitoring program is in place to identify and manage groundwater quality impacts and results reported annually to the DWER. Monitoring bores installed near refinery process buildings have shown some low level groundwater contaminated. This is due to past operational practice and meeting the regulations and standards of the time which are no longer acceptable due to a greater focus on environmental management. To assist with remediation, groundwater recovery bores have been installed within the refinery. Water recovered is directed into the refinery process and included in annual water use calculations reported to the CCN and authorities. An accredited Contaminated Sites Auditor has been engaged by Alcoa in 2019 to complete a Voluntary Auditors Report which will review all the Contaminated Sites work completed to date to ensure it has been completed to the required standards and that the data is representative of site conditions. Once the Auditors feedback has been addressed Alcoa will move forward with development of the Site Management Plan.

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	<p>that the alkali plume extends well beyond these areas and persistence of contamination from point source has occurred over two decades of operations".</p> <ul style="list-style-type: none"> • "The cause of elevated alkalinity in monitoring wells adjacent to ROWS pond and the cooling pond as not been comprehensively assessed". • "Plumes of alkaline ground water at the Wagerup Refinery have been noted in previous reviews in the Northern and Southern parts of the refinery and near the former hydrate stockpile". • "Seepage from ROCP1 in the shallow aquifer was deemed to occur during most of 2007 and possibly more of the first half of 2008". <p>As stated Peter Clifton & Associates (2008), groundwater flow is typically in a westerly direction. The persistence of alkali contaminants, such as sodium carbonate (as sodium) contamination is well known to affect plant health and growth rates. This kind of groundwater contamination potentially renders future use of water reserves for portable application more complex and costlier to treat and eliminate future prospects for farming due to the destruction of soil structures.</p> <p>A comprehensive assessment of the fate and persistence of the plume of contamination below the refinery, RSA and beyond has not been conducted by independent groundwater contamination specialists.</p>	
	<p>Based on the above points, CAPS doesn't not support the removal of condition 12, and provides the following recommendations:</p> <ul style="list-style-type: none"> • Alcoa should conduct an inquiry into water use at the Refinery and the RSA. • WUMPS should be provided by Alcoa to DWER for approval. • Alcoa should undertake a comprehensive assessment of the fate and persistence of the plume of contamination that exist below the refinery and RSA. 	<ul style="list-style-type: none"> • As indicated above, Alcoa has a water licence under the RIWI Act for the Wagerup refinery which has a requirement to have an Operating Strategy which includes a section on water conservation and efficiency. • Alcoa considers any Part IV condition simply duplicates the water regulation under the RIWI Act and its preference remains that condition 12 be deleted. • Alcoa provides annually its water usage data to the DWER and presents this information at the Community Consultative Network (CCN) each year as part of its commitments in the Wagerup Environmental Improvement Plan. • As stated above, monitoring bores installed near refinery process buildings have shown some low level groundwater contaminated. To assist with

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	<ul style="list-style-type: none"> Alcoa should undertake environmental remediation where contamination has occurred. 	<p>remediation, groundwater recovery bores have been installed within the refinery. Water recovered is directed into the refinery process and included in annual water use calculations reported to the CCN and authorities.</p>
Other/General		
CAPS	<p>Alcoa's application to change the conditions of the Ministerial Approval serves the purpose of trivialising the Refinery's impacts on the environment and surrounding communities and further reducing transparency, government control and oversight.</p>	<ul style="list-style-type: none"> Alcoa does not consider the proposed changes to conditions of MS 728 (as amended), sought through the Section 46 review, fundamentally alter the requirements of the existing conditions applying to expansion of the refinery. The amendments to MS 728 primarily relate to permitting production of the refinery to be increased in increments, with an initial increase in production to 3.3 Mtpa rather than through the construction of a single-stage Third Production Unit to 4.7 Mtpa. The amendments also seek to remove duplication with other regulation where considered appropriate.
	<p>Alcoa's environmental performance needs to be lifted dramatically to effectively minimise risks of human and environmental harm.</p> <p>The Refinery has been responsible for over 20 years of community agitation and been the cause of much social disruption, psychological and financial harm.</p>	<ul style="list-style-type: none"> The Wagerup refinery is subject to rigorous regulation under both Parts IV and Part V of the EP Act. In accordance with conditions, Alcoa carries out extensive monitoring of emissions which are reported to DWER to ensure compliance with condition standards.
	<p>Information is either dated, incomplete or misleading as well as lacking third-party verification.</p> <p>Operations at the Refinery require further investigation, ongoing monitoring and more exacting regulation.</p>	<ul style="list-style-type: none"> Alcoa considers the S46 document and appendices provide appropriate information to enable consideration of the Section 46 review of conditions of MS 728 (as amended). To provide stakeholders, including local communities, with further confidence that the refinery is safe, a revised Wagerup HRA for 3.3Mtpa will be conducted as part of the S46 review process. This will be independently reviewed via a process administered by the EPA and shared publicly. Implementation of the proposed amended conditions of MS 728 can require independent review of information by the IDRT if the DWER CEO considers necessary. The implementation of Independent Design Review Team (IDRT) as part of the Procedures to Ministerial Statement 728 (MS 728), administered by the DWER, ensures that Alcoa must demonstrate best

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		<p>practice pollution control measures are applied to any future expansion works.</p>
	<p>If Alcoa is found to be in breach of licence conditions, production be reduced to 2005 levels until compliance is assured.</p>	<ul style="list-style-type: none"> Alcoa submits an Annual Compliance Statement on licence conditions to DWER.
	<p>Risk assessments undertaken by Alcoa should consider long-term, cumulative sustainability impacts.</p>	<ul style="list-style-type: none"> Alcoa considers sustainability matters as part of operation and management of the refinery which was recently awarded Aluminium Steward Initiative certification in acknowledgement of its responsible production, sourcing and stewardship
	<p>Industry should be required to contribute to special fund run by government to pay for independent consultants and peer reviews.</p>	<ul style="list-style-type: none"> This is a matter for DWER and Government to consider.
	<p>The EPA should exercise precaution in its assessment of proposed changes to the Ministerial Conditions and overall assessment of the adequacy of existing licences.</p>	<ul style="list-style-type: none"> Comment noted.
	<p>The Bauxite and Alumina industry is increasingly incompatible with the environmental priorities WA faces such as needed emission reductions as well as addressing biodiversity loss and rising water scarcity.</p>	<ul style="list-style-type: none"> Alcoa believes the bauxite and alumina industry makes an important contribution to Western Australia. For its part, Alcoa seeks to implement best practice emissions controls, minimise impacts on biodiversity and manage water use on a sustainable basis.
<p><u>Condition 4</u></p>	<p>There is concern that incremental increases in output will effectively eliminate future assessments by the EPA under s46 of environmental factors and issues that may arise in connection with production increases. Irrespective of whether production increases occur gradually or sharply, associated impacts will rise.</p>	<ul style="list-style-type: none"> Alcoa acknowledges CAPS concern, however the proposed changes to condition 4 would not alter the requirements of section 46 of the EP Act in respect of MS 728.
	<p>CAPS objects to changes that would see the elimination of future assessments under s46 of environmental factors and issues associated with Refinery production increases.</p>	<ul style="list-style-type: none"> The proposed changes to condition 4 would not alter the requirements of section 46 of the EP Act in respect of MS 728.
<p><u>Changes to Schedule 1</u></p>	<p>The change to Schedule 1 removes references to the third production unit and introduces the term 'expansion works', which we do not object to. However, the proposed change also mentions that the Bayer process will be used (which was not specified in the original</p>	<ul style="list-style-type: none"> Alcoa has suggested inclusion of the words 'using the Bayer process' to be clear that the existing approval relates to expansion of the refinery using the Bayer process, and not any other bauxite refining process.

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	proposal) and it is unclear why this information was required.	<ul style="list-style-type: none"> Expansion of the refinery production by any other process would need to be considered as a revised proposal under the EP Act.

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