Via Email: Mark McGowan  mark.mcgowan@mp.wa.gov.au

Dear Premier

Re - Alcoa Reply Letter to Our Email to You – 12-8-17 (3 Attachments)

Please see attached Alcoa’s reply to our email to you dated 5 August 2017 regarding Wagerup mud lakes notwithstanding one in a hundred years 72-hour flood.

While according to the CBC News article attached refiners commonly use powerful presses to squeeze water out of the mud and evaporators to drive out most of the rest, Alcoa to our knowledge does not use presses to dry stack its waste.

Further, Alcoa refer to a waste stack height of 60m for their current 25-year residue storage plan. According to our information Alcoa were granted a revised height of 80m.

According to our information Alcoa commenced it so call dry stacking with current Residue Storage Area (RSA) 9 (approx. 2013) when RSA 9 came on-line. In years prior. Alcoa was using the wet stacking technique in Residues Drying Area (RDA) ponds 1-8.

The Executive Summary of Alcoa’s Scoping Document (dated 15th September 2004, page 3) states that a production volume of 2.35mtpa produces 4.8mtpa of toxic waste. Analogously, a doubling in output will lead to a doubling in waste production. Alcoa are currently producing 2.85mtpa of alumina (pending the outcome of our appeal against production increase) and thus approximately 5mtpa of toxic waste. The footprint of Alcoa’s drying areas, as stated in previous communications, is approximately 1500 acres (607 ha). A doubling in production capacity will double both the area and height of the mud lakes and thus increase dramatically contamination of land, air and groundwater.

Questions: -

- What studies have been done to quantify that Alcoa’s technique is equal to, or more efficient/effective than, the press technique?

- Where are the reports and who produced them?

- Have these reports (if any) been peer-reviewed, and if so, by whom?

- How successful will Alcoa’s technique be in drying stacking such a vast area and in the event of a one in a hundred year 72-hour flood?

- What is the allowable stack height for Alcoa (over current 25-year period and beyond)?
What strategies/contingency plans do the Government and Alcoa have to prevent RDA ponds 1-8 from collapsing?

Can the government and/or Alcoa define best practice and what it means? Does supposed best practice provide a guarantee for the local community and the environment that mud lakes will not collapse in the short-term or long-term?

Sincerely

Vince Puccio
Chairman: Community Alliance for Positive Solutions Inc

Proudly supported by:

"There is no greater act of courage than to do what is right."

SHINE LAWYERS
13 11 99 SHINE.COM.AU
10 August 2017

Dear Vince,

I refer to your email to the Premier of Western Australia of 5 August 2017. While I am unaware of the Hatch report you referenced, I can assure you that all of Alcoa's bauxite residue storage areas and associated facilities are designed, constructed and operated to the highest industry standards.

Residue at Wagerup Refinery is stored using a technique known as dry stacking. The residue mud is deposited and allowed to solar dry to at least 65 per cent solids such that it cannot liquefy and flow outside the residue storage area.

The article attached to your e-mail refers to the Magyar Alúminium (MAL) refinery in Hungary. This refinery used wet stacking, which produces a significantly weaker deposit that can potentially liquefy.

With regards to the size and height of the residue storage area, Wagerup refinery's current 25-year residue storage plan is based on a stack height of 60 metres.

I am very satisfied that we are applying best-practice in the construction and operation of our Wagerup residue storage areas and that our operations do not represent a risk to the local community or environment. If you have any further queries about the Wagerup Refinery please contact Wagerup Refinery Community Relations Manager, Tom Busher, on 0404 800 135.

Yours sincerely,

Simon Butterworth
Chief Operating Officer
Alcoa Alumina
Red mud: Toxic waste of aluminum refining


Red mud is a toxic byproduct of the industrial process that refines bauxite, raw aluminum ore, into aluminum oxide, or alumina.

(Alumina is put through a separate process, electrolysis, to make aluminum metal.)

Toxic red mud flooded thousands of homes this week near the town of Devecser, Hungary. ((Bela Szandelszky/Associated Press))
Bauxite is a mixture of minerals. In addition to aluminum compounds it contains iron oxides, sand, clay and small amounts of a form of titanium oxide called anatase; it can also hold traces of radioactive minerals, such as uranium or thorium compounds.

This raw material is bathed in a solution of a strong base — sodium hydroxide (lye or caustic soda) — at a high temperature and pressure. The aluminum compounds in the bauxite dissolve in the hot caustic solution while the other components remain behind.

Everything that doesn't get dissolved in the process is called red mud, its rusty colour deriving from the iron compounds.

Depending on the origin, quality and composition of the bauxite, the amount of red mud left over from the alumina refining can vary widely. For every tonne of alumina produced, the process can leave behind a third of a tonne to more than two tonnes of red mud.

The mud is a complex chemical soup, a watery slurry of fine rock particles and salts, containing toxic heavy metals. It can be slightly radioactive if the original bauxite contained radioactive minerals.

The mud also has a high pH because of the sodium hydroxide solution used in the refining process. The base is strong enough to kill plant and animal life, and to cause burns and damage to airways if the fumes are breathed.

Other than some limited use as a pigment in the manufacture of bricks and concrete, the red mud is waste. Although it contains useful elements, such as iron, titanium and residual aluminum, there is no economically viable way to extract them from the mud.

Most refineries collect the mud in open ponds to allow some of the water to evaporate. Once it's dry, after several years, the red mud is buried or mixed with soil.

The red mud is kept in reservoirs, so there is the possibility of leaks and floods, as seen in western Hungary.

Because of this, some refiners, including the Rio Tinto Alcan refinery in Jonquière, Que., use powerful presses to squeeze the water out of the mud and evaporators to dry most of the rest. The company says up to 90 per cent of the Quebec site's waste is dried before being stored.
Alcoa
Wagerup ROWS Pond Project WG 0159
ROWS Pond Capacity
Problem Definition

PROJECT NO.: H336562

DOCUMENT NO:

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Executive Summary

During the RSA 9 Project (WG 0159) FEL2.2 it was identified that with expansion of the residue area current ROWS Pond capacity will not meet the required design criteria when RSA 9 is constructed, which is forecast to be in mid 2013, or for RSAs beyond this date. The ROWS Pond Project, a result of identifying this problem, is currently in problem definition phase and will culminate in agreement of the Design Criteria to be progressed into Solution Analysis.

Alcoa has a water balance for the contaminated water streams on-site. Hatch has modified the balance to calculate monthly operating storage volumes so the wet season ROWS Pond volume peaks can be identified. In addition, Monte Carlo analysis of rainfall has been incorporated to forecast rainfall when simulating future storage volume requirements.

This model has allowed for the analysis of various scenarios with four scenarios selected for analysis:

1. Overflowed volume if a 1% wet year occurs
2. Overflowed volume if a 1% wet year occurs, followed by an average year
3. Overflowed volume if a 1% wet year occurs, followed by one year of Monte Carlo forecast rainfall data

All scenarios analysed indicate that current ROWS Pond capacity is insufficient for future requirements, with the size of the capacity deficit dependent on the level of acceptable risk and period length analysed. The deficit increases with time due to the expected residue area expansion, which results in a greater amount of run-off collected per unit of rainfall (mm).

Traditionally Alcoa has used the 1% wet year as the basis for ROWS Pond capacity design, which results in a capacity deficit ranging from 400 ML in 2014 to 1,000 ML in 2020, with the deficit increasing due to the anticipated growth of the residue area.

Modelling indicates that there will be an accumulation of volume in the ROWS Pond following an average rainfall year (860mm/yr) unless activities outside normal operations occur to remove the volume stored in the ROWS Pond. This is reflected in the Scenario two results, whereby the ROWS Pond continues to overflow in the year following a 1% wet year if an average rainfall year is experienced, and operations are unable to remove ROWS water outside of the modelled activities.

Scenario three also indicates continued ROWS Pond overflows in the year following a 1% wet year using rainfall forecast by the Monte Carlo simulation, with the level of acceptable risk influencing the magnitude of overflowed volume.

Scenario four doesn’t force a 1% wet year, forecasting rainfall for the entire period instead and produces the most conservative short-term overflow result. If a 1% level of risk is assumed, then the deficit in ROWS capacity until July 2016 is 287 ML. The deficit in ROWS capacity increases rapidly however to almost 3,000ML in July 2020.
1 Background

The Wagerup ROWS Pond is designed to store low TA run-off water collected from the residue area. The water collected in the ROWS pond supplies the high TA water circuit during the dry season when evaporation exceeds rainfall resulting in the high TA water circuit balance becoming net negative.

During the RSA 9 Project (WG.0159) FEL2.2 it was identified that with expansion of the residue area to include RSA 7N and 8, the current ROWS pond has insufficient capacity to store a 1% wet year. Current ROWS Pond capacity will not meet the required design criteria when RSA 9 is constructed, which is forecast to be in mid 2013, or for RSAs beyond this date. The ROWS Pond Project, a result of identifying this problem, is currently in problem definition phase and will culminate in agreement of the Design Criteria to be progressed into Solution Analysis.

2 Introduction

Alcoa has a water balance for the contaminated water streams on-site. The current refinery operating practice is to transfer from the ROWS pond to the Cooling Pond in summer. This is intended to maintain the Cooling Pond at a constant level. In the balance, the steady state discrepancy between water inputs and outputs is calculated and the annual discrepancy stored as either volume accumulation or consumption in the ROWS Pond. The operating practice to is reduce the ROWS pond to minimum level by May each year (400 ML), however the calculated annual stored volumes using the accumulation/consumption method correlate well with historical data on an annual basis.

Hatch has modified the balance to calculate monthly operating storage volumes so the wet season ROWS Pond volume peaks can be identified. In addition, Monte Carlo analysis of rainfall has been incorporated to forecast rainfall when simulating future storage volume requirements. The Monte Carlo model forecasts future rainfall data, using a Gamma distribution probability density function derived from historical rainfall data and stores the outputs for Monte Carlo analysis.

The modelling has been done allowing for future residue expansion milestones, and the projection of future storage volume allows Alcoa stakeholders to specify the Design Criteria for the Project in full knowledge of the constraints under which the design is valid.
3 Basis for Projecting Future Volumes

3.1 Operating Basis
Current ROWS capacity is 4,000 ML whilst the minimum operating volume allowable is 400 ML. Hence the current ROWS pond provides up to 3,600 ML of surge capacity.

No change was made to the existing basis used in the water balance model, and so discrepancies between the water inputs and outputs were stored as either volume accumulation or consumption in the ROWS pond.

A ROWS pond starting operating volume of 400 ML for the start of May 2011 was used. The model contains historical rainfall data up to mid 2010, and when reviewed in line with the current dry year, achieving the minimum level prior to winter 2011 is reasonable.

3.2 Forecasting Basis
All modelling has been performed allowing for:

- An alumina production rate creep of 50tpd stepped annually, with a base production of 7,000tpd in 2010.
- Condensate evaporative losses in the cooling towers at a rate of 0.22kl/tonne of alumina production.
- Annual pump-up from the detention ponds to the upper/lower dam of 300 ML total across August and September if rainfall for the previous 12 months is < 900mm.
- RSA 9 is modelled to be online in July 2013.
- RSA 10 is modelled to be 43ha and online in July 2016.
- RSA 11 is modelled to be 43ha and online in July 2019.
- Additional RSA construction beyond 2019 has not been considered.

3.3 Weather Basis
Provide sufficient water storage for a 1% wet year (1400mm of cumulated rainfall within twelve consecutive months).

Contain the run-off collected from an average rainfall year in the year following a 1% wet year. An average rainfall year is equivalent to 860mm/year.

Extinguishing factors such as a 1% 72hr storm event contributing to the 1% wet year have not been considered.
4 Capacity Projections

4.1 Scenarios Modelled

Alcoa has historically determined run-off storage capacity requirements by applying a 1% wet year. The model uses differing run-off co-efficients between active storage areas, remediated areas and water bodies. No change was made to any parameters relating to these factors when modelling.

Modelling results for the capacity required at the conclusion of each incremental expansions of the residue area between 2010 and 2022 are shown in Table 4-1. Four capacity scenarios have been modelled:

Scenario 1
Current ROWS Pond level at 400ML for the start of May in the year following the construction of a new RSA, whereby a 1% wet year is endured. This scenario indicates the minimum overflow volume / additional ROWS capacity required in order to contain a 1% wet year.

Scenario 2
Current ROWS Pond level at 400ML for the start of May in the year following the construction of a new RSA, whereby a 1% wet year is endured, followed by an average rainfall year. This scenario indicates the ROWS Pond volume the year after a 1% wet year has occurred, with modelled operations indicating whether additional volume has been accumulated or magnitude of ROWS capacity reclaimed following a 1% wet year.

Scenario 3
Current ROWS Pond level at 400 ML for the start of May in the year following the construction of a new RSA, whereby a 1% wet year is endured, followed by rainfall forecast by the Monte Carlo analysis. Similar to Scenario two, except the rainfall year following a 1% wet year is independently forecast, based on historical data and probability.
Scenario 4
Current ROWS pond level at 400ML in May 2011. Storage capacity is on based on operating basis, forecast criteria and projected rainfall in each year from Monte Carlo analysis until 2022. This scenario indicates the required ROWS capacity using forecast rainfall for the entire analysis period.

Monte Carlo

<table>
<thead>
<tr>
<th>Year</th>
<th>ROWS Pond Overflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>RSA 9</td>
</tr>
<tr>
<td>2016</td>
<td>RSA 10</td>
</tr>
<tr>
<td>2019</td>
<td>RSA 10</td>
</tr>
<tr>
<td>2022</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Modelling Results
Where the Monte Carlo has been applied, both the 95th and 99th percentile overflow results are provided so the magnitude of the change with probability can be assessed.

Table 4.1: Scenario modelling results

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROWS Pond Overflows</td>
<td>ROWS Pond Overflows</td>
<td>95th Percentile overflows</td>
<td>99th Percentile overflows</td>
</tr>
<tr>
<td>July 2013 - June 2016 (RSA 9 online)</td>
<td>420 ML</td>
<td>887 ML</td>
<td>1,329 ML</td>
</tr>
<tr>
<td>July 2016 - June 2019 (RSA 10 online)</td>
<td>740 ML</td>
<td>1,462 ML</td>
<td>1,902 ML</td>
</tr>
<tr>
<td>July 2019 - June 2022 (RSA 11 online)</td>
<td>1,061 ML</td>
<td>2,044 ML</td>
<td>2,305 ML</td>
</tr>
</tbody>
</table>

The modelling results indicate that current ROWS Pond capacity will be insufficient to meet future needs, with the deficit of ROWS Pond capacity dependent on the required design life of the ROWS Pond and the method of analysis.

Traditionally Alcoa has used the 1% wet year as the basis for ROWS Pond capacity design, which results in a capacity deficit ranging from 400 ML in 2014 to 1,000 ML in 2020, with the deficit increasing due to the anticipated growth of the residue area which increases the run-off collected for storage.

Modelling indicates that there will be an accumulation of volume in the ROWS Pond following an average rainfall year (860mm/yr) unless activities outside normal operations occur to remove the volume stored in the ROWS Pond. This is reflected in the Scenario two results, whereby the ROWS Pond continues to overflow in the year following a 1% wet year if an average rainfall year is experienced, and operations are unable to remove ROWS water outside of the modelled activities.

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