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AVERTAS ENERGY FROM WASTE PROJECT SUMMARY OF ADDITIONAL APCR TREATMENT TRIALS

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Made by Lyon McLeod
Checked by John Miragliotta
Approved by John Miragliotta
Description This report provides a summary of the additional lab scale trials carried out for the purpose providing further data to support the use of cement and phosphoric acid for treating Air Pollution Control residues in order to enable disposal to a Class III landfill in Western Australia.

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Ramboll
Level 7, 41 St Georges Tce
Perth WA 6000

T +61 8 9225 5199
www.ramboll.com

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1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was engaged by Kwinana WTE Project Co Pty Ltd trading as Avertas Energy (Avertas), to carry out additional Air Pollution Control residues (APCr) treatment trials to provide additional data and analysis to support the treatment and disposal of APCr to landfill in Western Australia (WA). This report provides an executive summary of the assessment. A separate report has been prepared that includes the full analytical results (Ramboll, 2021).

The Avertas Energy from waste (EfW) facility will be located on Lot 9501, Leath Road, Kwinana Beach, in the Kwinana Industrial Area, about 40 km south of Perth in Western Australia. The Avertas EfW facility will produce approximately 23,000 tpa of raw APCr, which require treatment to reduce leaching potential of heavy metals prior to disposal to landfill. Ramboll understands that Avertas is considering disposing of the treated APCr to a lined cell, which will have an appropriate leachate collection and treatment (via evaporation) and will be capped with a low permeability cover to minimise potential for leachate generation. If disposed to a Class III landfill cell it will be as a monocell solely designed and operated to accept the treated APCr only. If disposed to a Class IV landfill cell, then the treated APCr can be co-disposed with other Class IV materials.

Ramboll has previously carried out APCr treatment trials (referred to as 'initial APCr treatment trials') (Ramboll, 2020), with the objective of assessing the suitability of using cement and phosphoric acid in order to treat APCr and enable disposal to a Class III landfill in WA. The results of these initial APCr treatment trials suggested that, due to concentrations of lead in leachate, a comparable raw APCr to that produced by the Avertas EfW facility would be classified as Class V waste in accordance with the Department of Water and Environmental Regulation (DWER) Landfill Waste Classification and Waste Definitions 1996 (as amended 2019). The report concluded the cement treatment would be suitable for reducing lead to leachable lead concentrations low enough to meet Class III criteria and therefore enable landfill disposal at suitably licenced landfill sites. Due to the preliminary nature of the trials the report recommended that additional data was required to provide further assurance on the extent of cement treatment required to meet landfill criteria.

2. METHODOLOGY

The additional APCr treatment trials were designed based on the methodology adopted for initial APCr treatment trials (i.e. using the same raw APCr, cement and treatment methodology). The additional APCr treatment trials comprised the manufacture of seven APCr mixes (referred to as Mix 1 to Mix 7) that included 15, 20, 25 and 30% cement treatment. Mixes with 15, 20 and 25% cement treatment were also manufactured including the addition of Phosphoric acid (H_3PO_4) added at a rate of 2.5% of solids, to assess the benefits in addition to cement treatment.

The treated APCr samples were allowed to cure at room temperature for 28 days prior to transport to National Association of Testing Authorities, Australia (NATA) accredited laboratories for analysis for total and leachable concentrations. The analysis included a 'general suite' of contaminants of concern as per the initial APCr trials as well as additional analytes requested by the DWER.

Up to nine replicates from each treatment mix were analysed for the metals suite using Australian Standard Leaching procedure (ASLP) with deionised (DI) water. Samples from the 20% cement treated APCr sample, which was predicted to be close to optimal treatment level,

were analysed by two external laboratories for quality control purposes as well as being analysed using the United States Environmental Protection Agency (US EPA) Leaching Environmental Assessment Framework (LEAF) testing.

ASLP testing is requested by the DWER for landfill waste classification purposes and is considered to provide suitable data for the APCr treatment trials. The ASLP test methodology required that the treated APCr to be ground to <2.4 mm in order to achieve equilibrium conditions within the duration of the ASLP test (approx. 18 hours). Achieving equilibrium conditions in the ASLP test is required in order to predict maximum leachable concentrations. The ASLP test also uses a liquid to solid ratio of 20:1 and DI water (neutral pH) was selected as the leaching solution. The results obtained from the ASLP procedure as a part of these trials are considered to provide a good prediction of long-term maximum leaching concentration for a scenario where treated APCr is disposed to landfill with homogenous conditions, a neutral starting pH and relatively high infiltration rates.

3. RESULTS AND DISCUSSION

The results of the additional APCr treatment trials are summarised below.

- The leaching of lead in raw sample is higher than in the stabilised samples;
- Increasing the cement treatment level above 20% cement did not result in a significant decrease in recorded leachable lead concentrations;
- The addition of phosphoric acid to a mixture results in lower pH and lower leaching of lead when compared to the same mixture with only cement;
- The data collected from additional APCr treatment trials is considered to be consistent with the initial APCr trials;
- Recorded concentrations of leachable lead in all 64 samples analysed as a part of the additional APCr trials were less than the Class III landfill criteria;
- As previously recorded in the initial APCr treatment trials, dioxins and furans were observed to leach at low concentrations from the raw APCr and treated residues and consequently are not expected to pose a risk once landfilled.;
- Salts leached at similar concentrations in the raw and treated residue samples, and
- Additional contaminants requested by DWER were either below relevant landfill criteria and/or below analytical limit of reporting (LOR). Contaminants that recorded concentrations above LOR and with no relevant landfill criteria available, will be considered during site specific landfill risk assessments where relevant.

The expanded data set, now including 81 ASLP test results, demonstrate that treatment of raw APCr with 20% cement, or 15% cement with phosphoric acid, is suitable to meet Class III criteria in accordance with Landfill Guidelines.

Management of other contaminants that are not specified in the Landfill Guidelines, dioxins and furans and salts will require consideration during treatment and disposal. Risks associated with dioxins and furans will be greatest during handling and treatment of the raw APCr. This may include particulate transport by either dust migration or overland flow. Avertas is designing a cement treatment plant for the management of APCr (closed pneumatic transport systems, personal protective equipment, dust monitoring etc.) which is considered to be sufficient to manage risks associated with dioxins and furans in handling raw APCr.

In the long term the structure of the treated APCr will degrade as salts are leached. However, the concentrations of contaminants (heavy metals etc.) should not increase above those recorded in

these trials. Avertas is proposing to dispose the treated APCr to a lined cell, which will have an appropriate leachate collection system.

Mix 3 (20% cement treatment) was submitted for LEAF testing including Method 1313, 1315 and 1316. The results from the LEAF testing support those recorded using the ASLP testing, in particular for risk assessment purposes where the results can be interpreted to predict leaching concentrations that are most representative of the environment of proposed management/disposal location.

4. RECOMMENDATIONS

The following recommendations were as a part of the additional APCr trials:

1. To assess if the recorded concentrations of leachable salts in the treated APCr pose a risk when dispose to an appropriate cell, a risk assessment should be carried out to predict the impacts to human health and ecological receptors should there be an uncontrolled release of leachate from the landfill or treatment facility.
2. As a part of the approvals process to develop and operate the APCr treatment plant, a risk assessment will be carried out to quantify the risks associated with the recorded concentrations of dioxins and furans in the raw and treated APCr. The risk assessment will consider all activities that have the potential for human health exposure to raw and treated APCr, and assess the exposure scenario that may have 'worst case' exposure to human health. Should it be determined in the risk assessment that the 'worst case' scenario presents an acceptable human health risk then it can be concluded that the other activities for APCr management are also acceptable.

5. REFERENCES

DWER 2019. Landfill Waste Classification and Waste Definitions 1996 (as amended 2019), December 2019

Ramboll 2020. Avertas Energy From Waste Project, APCr Treatment Trials, Ref No. 1100035545-019 ATR13, Dated November 2020

Ramboll 2021. Avertas Energy From Waste Project, APCr Treatment Trials, Ref No. 1100035545-019 ATR26, Dated September 2021