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Chunxing Used Lead Acid Battery (ULAB) recycling plant

Summary of the EPA Works Approval application

Prepared for:
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1 The project

This proposal by Chunxing Corporation Pty Ltd is to establish a state-of-the-art technology Used Lead Acid Battery (ULAB) recycling plant at No 2047 Fourth Rd, Hazelwood North, near Morwell, Victoria.

1.1 Background: lead acid batteries

Lead acid batteries are relatively simple electrochemical devices able to store electrical energy and deliver it to motors and other appliances when needed. Unlike common dry cell or alkaline batteries used in touches and other household appliances, lead acid batteries may be recharged after the stored energy has been used. This is why they are widely used in motor vehicle starting energies and running appliances (e.g. air conditioning, headlights). Although the starter motor and headlights use much of the battery's stored energy, the battery is continuously recharged by the alternator during normal running of the engine.

Lead acid batteries are made up of sheets of lead immersed in a 'bath' of sulfuric acid. Usually the whole assembly is contained in a robust plastic case made of polypropylene or polyethylene.

Although lead acid batteries may be charged and re-charged many times, each cycle places small stresses on the lead plates, which eventually distort. This causes short circuits within the battery so that the battery is unable to hold stored energy for a prolonged period. Depending on operating conditions and other factors, a number of other processes may take place in the battery which coat the plates with scale or other non-reactive material, making them difficult or impossible to re-charge.

As a result of these degradation processes batteries become unusable and are then known as used lead acid batteries (ULABs) and are waste. In Australia the lifetime for motorcar batteries is typically three to four years, while for trucks and tractors the typical lifetime is two to three years.

1.2 Description of the Hazelwood North proposal

Chunxing Corporation Australia Pty Ltd will use patented secondary lead smelting technology supplied by New Chunxing Resource Recycling Group, the second largest recycler of lead acid batteries in the world. The lead, plastic and electrolyte (sulfuric acid) in ULABs will be recycled, as is commonplace in secondary smelting. Around 98% of the material in each battery will be recycled.

Currently, Australia generates about 150,000 tonnes of ULAB, most of which is sent to three existing facilities (RMT in Wagga Wagga NSW, Hydromet in Unanderra NSW and V Resource in Loganholme Qld). However, only RMT conducts secondary lead smelting to produce lead product – the other two are simply 'battery breakers', which then send lead-containing waste overseas, where the smelting of lead occurs (and therefore real value is realised).

Even worse, some ULABs are exported as whole 'wet batteries': Battery Rescue Australia Pty Ltd 2017[1] estimated that 16% of total ULAB volumes were either exported in this way,

[1] Battery Rescue Australia Pty Ltd (2017), *Creating a Safer, Environmentally Sustainable Used Lead Acid Battery Recycling Industry for Australia*, available at: https://www.unisegproducts.com/wp-

illegally landfilled or retained in stockpile. Almost 70% of the ULAB market comes from NSW and Vic, but there is no recycling capacity in Vic at present. Chunxing believes that the Latrobe Valley location will be strategic for the south-east markets, which will reduce the number of batteries managed illegally, outside recycling infrastructure.

Chunxing's Hazelwood North plant will therefore be a full secondary lead smelter, which will produce lead products, a highly valuable commodity that is returned back to battery manufacturers, ensuring maximum value recycling. The facility will process 50,000 tonnes per year of ULABs and recycle them into 28,000 tonnes of refined lead per year. The main waste will be approximately 4,000 tonnes per year of lead-containing smelting slag.

At a high level, the proposed project can be described as three conceptual processing stages:

- First stage - physical breakdown of the batteries into its components i.e. metallic lead grid, lead oxide paste, plastics and spent acids.
- Second stage - further processing of the plastics and spent acids to convert them into value added products, such as chipped plastic for further recycling and fertiliser grade zinc sulfate.
- Third stage - melting and smelting of lead components recovered into refined lead products.

1.3 The Chunxing China reference plant

New Chunxing Resource Recycling Group (http://www.jschunxing.com/e/) is the major shareholder of Chunxing Corporation Pty Ltd, and the design of the Hazelwood plant is based directly on their Jiangsu Province, China plant, a modern 800,000 tonne/ yr (battery capacity) facility that is the largest ULAB (secondary smelting) recycler in China. This plant and key monitoring data received from it has been used in the environmental assessment as the reference plant for estimation of impacts on key environmental segments as follows:

- in estimating emissions to air, based on an approximate scaling rate of Hazelwood being 1/16th the capacity (size) of the China plant
- in describing the technology and estimating the energy (electricity and fuel), raw materials and water resources it will use
- estimating the volumes of products and by-products the Hazelwood plant will produce
- the composition and volume of slag and other key wastes the Hazelwood plant is likely to produce.

2 Proposed Hazelwood North location

No 2047 Fourth Rd, Hazelwood North is within industrial 2-zoned land. The surrounding land is developed Industrial 2 Zone, containing other industrial premises The next layer of land radiating outwards from Fourth Road is zoned as Industrial 1. The site, shown in Figure 1, is part of the previous Lurgi Coal Gasification Plant site, redeveloped as part of the Gippsland Heavy Industry Park Infrastructure Project.

content/uploads/2017/07/Creating-a-Safer-More-Environmentally-Sustainable-Battery-Recycling-Industry-for-Australia-V3.pdf

Figure 1: Proposed site: No 2047, Fourth Rd, Hazelwood North

2.1 Nearest residences

The area immediately surrounding the site is largely agricultural and industrial. The nearest residence is approximately 1.1km away and there is a primary school (Hazelwood North Primary) located approximately 1.7 km south east from the nearest point on the proposed site boundary. The nearest suburban residential area is Morwell South, its southernmost edge approximately 2.1km to the north of the proposed site.

The locations (known as sensitive receptors) included in the air quality model are shown in Figure 2. The distances indicated in the sensitive receptor labels (SR# in Figure 2) are indicative of the distance to the nearest point on the proposed site boundary.

A minimum buffer distance for 'non-ferrous metal production greater than 2,000 tonnes per year' is specified in EPA Publication 1518[2] as 500 metres. All residences are more than double this minimum buffer distance away.

[2] EPA 2013, Publication 1518, *Recommended separation distances for industrial residual air emissions*, available at: https://www.epa.vic.gov.au/business-and-industry/guidelines/~/media/Publications/1518.pdf

Figure 2: Buffer distances to the nearest sensitive receptors in all directions from the proposed site

3 Environmental assessment

The EPA Works Approval process requires a range of environmental assessments to be undertaken. The results of these are detailed in the EPA Works Approval application, and are summarised at a high level in Table 1 below.

Table 1: Summary of environmental assessments undertaken

EPA Works Approval application section no.	Environmental segment	Assessment summary	(Negative) impact on environment
6	Energy use and GHG emissions	• Annual 17kt CO_2-e emission is low compared to other Latrobe Valley sources (0.04%). • Due to avoided primary lead extraction/ manufacturing emissions, Chunxing ULAB plant is a net GHG reducer (net emissions -32kt CO_2-e) • Chunxing ULAB plant is twice as energy efficient as traditional ULAB smelting processes • Demonstrated to meet best practice	None – net positive impact
7	Water resource use	Below the WAA Guideline threshold of 10 ML/year due to wastewater reuse and full harvesting of site water runoff	Negligible
8	Air (pollutant) emissions	• Air pollutant emissions are assessed as being orders of magnitude below ground level concentrations specified in SEPP (AQM) Design Criteria. • Class 3 indicators are assessed as meeting SEPP (AQM) requirements for reduction to MEA. • All emissions meet EU IED emission limits • Demonstrated to meet best practice	Low
9	Noise emissions	The noise from plant equipment sources is assessed to be well in compliance with the *recommended maximum noise levels* calculated at the nearest *noise sensitive area* (1.1km away), according to EPA's NIRV guideline during day, evening and night periods.	Low
10	Water emission	The proposed plant will not: • discharge to waterways • discharge contaminated runoff to stormwater	Negligible
11	Land & groundwater	The proposed plant will not: • store petroleum products underground • transfer petroleum products by pipeline • extract groundwater or inject waste or other materials into groundwater. • discharge to land, and risk of accidental discharge will be controlled through bunding and drainage/ collection through the waste water treatment system.	Very low

EPA Works Approval application section no.	Environmental segment	Assessment summary	(Negative) impact on environment
12	Waste	• Prescribed Industrial Waste (PIW) generation of 5,500 t yr is made up mostly of lead-containing slag (4,500 t/yr). • Slag volumes are well below those from alternative smelting technologies – managed under the PIW framework by landfill or treatment followed by landfill, depending on hazard categorisation • Pb levels in slag are well below those from alternative smelting technologies • Strong overall circular economy outcome due to diversion of 50,000t/yr of Pb scrap currently exported.	Low-medium

Air quality is a major consideration in any thermal process. This is highlighted for discussion in the next section, although the full EPA Works Approval application dedicates significant analysis to all areas of the environmental assessment.

4 Air quality assessment

The Hazelwood plant's emissions characteristics were based directly on those reported in routine monitoring data from the Chunxing China reference plant, and were taken as a 1/16th fraction of the China plant's emissions. The plume dispersion behaviour was modelled using the AERMOD regulatory air dispersion model, with site specific meteorological and terrain files, to predict the ground level impact (ground level concentrations or GLCs). Background data was used from the nearest ambient monitoring station that had been operating for the full duration of the assessment period (Morwell East).

The detailed air quality modelling report describes modelled GLCs from a number of perspectives. Table *2* summarises the most critical information. It takes the lowest, highest and average stack emission results in kg/hour (model inputs scaled from the China reference plant), and identifies the single worst (highest) GLC, which could be located anywhere in the 5km x 5km domain. As per EPA guidelines, the worst result is defined as the one located at the 99.9th percentile of all results listed lowest to highest – the highest result excluding statistical outliers.

These worst case GLCs for lowest, highest and average stack emissions are then expressed as a percentage of the Design Criteria for each pollutant – the concentration limits set by EPA for the protection of human health. All emissions modelled meet the Design Criteria with a large margin of comfort, with results ranging from 0.01% for antimony through to 3.99% for arsenic.

Lead is perhaps the most scrutinised emission for this type of plant, given that this metal is the target of recovery in secondary lead smelting. The worst case GLC identified at any hour in the five years, and within any part of the domain, based on the average stack emission, is just 0.31% of the Design Criteria.

The detailed air quality modelling report also looks directly at predicted levels at each of the closest identified sensitive receptor locations, which are typically houses in Hazelwood North but also a local school. GLCs at these locations are included for the final year (2016) as an example of the worst case predicted contributions to ambient levels at those locations, taking the worst hour across the dataset. This enables direct comparison with Design Criteria from the SEPP, which is shown in percentage terms in Table 3.

Since dilution of the plume occurs quickly within the first few hundred metres of the emission point, the levels predicted to be experienced at these locations are typically an order of magnitude lower than those maximum levels shown elsewhere in the study domain.

The summary of the air quality modelling assessment is that the highest (worst case) ground level concentrations predicted to occur at any point in the domain, for all pollutants modelled, are significantly within Design Criteria limits, typically by a factor of 50- >100 times. In the case of lead, the worst case ground level concentration identified at any hour in the five modelled years, and within any part of the domain, based on the average stack emission, is just 0.31% of the Design Criteria. These estimates reduce by an order of magnitude at nearest sensitive receptors.

Table 2: Summary of modelled GLC results (99.9th %ile) 2012 - 2016

Parameter	SUMMARY OF ANNUAL RESULTS (the highest min, max and ave found between 2012 and 2016) - NO BACKGROUND					
	SITE GLC (99.9th %ile) - ave as per SchA unless noted			Percentage of Design Criteria		
	Lowest Stack Result	Highest Stack Result	Ave Stack Result	Lowest Stack Result	Highest Stack Result	Ave Stack Result
	mg/m³	mg/m³	mg/m³	%	%	%
Sulfur dioxide	0.0001	0.0010	0.0006	0.03%	0.23%	0.13%
Nitrogen oxides	0.0013	0.0075	0.0037	0.70%	3.93%	1.96%
Total Dust (TPM) - (criteria for PM_{10} toxicity)	0.0001	0.0027	0.0008	0.13%	3.39%	0.97%
Total Dust - (criteria for nuisance TPM)	0.0002	0.0051	0.0015	0.06%	1.55%	0.44%
Hydrogen fluoride (24hr)	0.000003	0.0002	0.0001	0.12%	6.97%	2.82%
Lead	0.000001	0.000030	0.000009	0.03%	1.02%	0.31%
Sulfuric Acid Mist	0.00002	0.00093	0.0003	0.05%	2.82%	1.04%
Chromium and its compounds	0.00000074	0.00000841	0.0000046	0.004%	0.05%	0.03%
Arsenic and its compounds	0.00000667	0.00000690	0.0000068	3.93%	4.06%	3.99%
Cadmium and its compounds	0.00000030	0.00000031	0.0000003	0.91%	0.94%	0.92%
Tin and its compounds	0.00000010	0.00000103	0.0000006	-	-	-
Antimony and its compounds	0.00000041	0.00000221	0.0000013	0.002%	0.01%	0.01%
Dioxins and Furans (as TCDD I-TEQs)	0.000000000018	0.000000000019	0.000000000018	0.49%	0.50%	0.50%

Source: AUBIN Environmental (2019), Air Quality Impact Assessment for the Chungxing Corporation Pty Ltd (available at Appendix F of the EPA Works Approval application)

Notes:

1. There is no design criteria set for tin.

Table 3: $GLC_{(99.9th\ \%ile)}$, 2016 MET file, no background, at specific sensitive receptor locations

Parameter	Design criteria	Nearest sensitive receptors								
	mg/m^3	SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9
Sulfur dioxide	0.45	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.01%	0.01%
Nitrogen oxides	0.19	0.43%	0.48%	0.47%	0.43%	0.38%	0.50%	0.42%	0.22%	0.19%
Total Dust (TPM) - (criteria for PM_{10} toxicity)	0.08	0.21%	0.23%	0.23%	0.21%	0.19%	0.24%	0.21%	0.11%	0.09%
Total Dust - (criteria for nuisance TPM)	0.33	0.05%	0.06%	0.06%	0.05%	0.05%	0.06%	0.05%	0.03%	0.02%
Hydrogen fluoride (24hr)	0.0029	0.61%	0.68%	0.68%	0.61%	0.55%	0.72%	0.60%	0.32%	0.27%
Lead	0.003	0.07%	0.07%	0.07%	0.07%	0.06%	0.08%	0.07%	0.03%	0.03%
Sulfuric Acid Mist	0.033	0.12%	0.13%	0.13%	0.12%	0.11%	0.14%	0.12%	0.06%	0.05%
Chromium and its compounds	0.017	0.003%	0.003%	0.003%	0.003%	0.003%	0.004%	0.003%	0.002%	0.001%
Arsenic and its compounds	0.00017	0.46%	0.51%	0.51%	0.46%	0.41%	0.54%	0.45%	0.24%	0.20%
Cadmium and its compounds	0.000033	0.11%	0.12%	0.12%	0.11%	0.10%	0.12%	0.10%	0.06%	0.05%
Tin and its compounds	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Antimony and its compounds	0.017	0.0009%	0.0010%	0.0010%	0.0009%	0.0008%	0.0010%	0.0009%	0.0005%	0.0004%
Dioxins and Furans (as TCDD I-TEQs)	0.0000000037	0.057%	0.064%	0.063%	0.057%	0.052%	0.067%	0.056%	0.030%	0.025%

Source: AUBIN Environmental (2019), Air Quality Impact Assessment for the Chungxing Corporation Pty Ltd (available at Appendix F of the EPA Works Approval application)

4.1 Comparison with emissions from other plants

Table 4 compares emissions from the proposed Hazelwood plant to other ULAB plants or primary lead smelting in Australia, other lead emitters in the Latrobe Valley region and literature data for secondary lead smelting.

The most relevant emissions comparison is against the only other ULAB smelter in Australia, a 46kt per year plant in Wagga Wagga, NSW. There is also a similar smelter in Laverton Vic which is currently not operational, but does have an EPA licence and corresponding emission limits for lead and other primary pollutants. At an extreme end of the scale is the Nyrstar Port Pirie (SA) primary lead smelter, which is very large and has a notable history of impacts from lead pollution. Lastly there is the contribution to the Latrobe Valley airshed from other major industrial emitters in the local area, that is worthy of comparison.

This comparison, using lead as one of the primary pollutants of interest, is shown in Figure 3, excluding those facilities that are higher by two or more orders of magnitude (Nyrstar Port Pirie primary lead smelter and the currently closed Hydromet Laverton secondary lead smelter's maximum licence limit), since the scale of their emissions would swamp the other facilities.

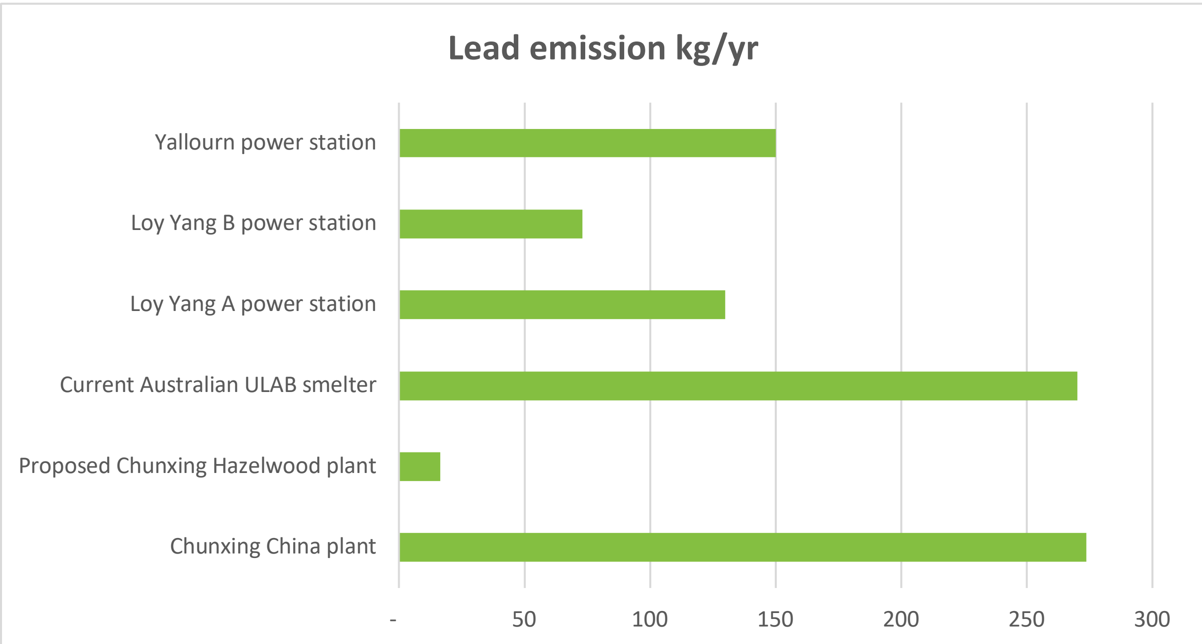

Figure 3 Comparison of lead emissions per facility, kg/ year

Table 4: Comparison of Chunxing lead emissions to similar plants

Lead emission unit of measure	Lead emission facility								
	Chunxing China plant	Proposed Chunxing Hazelwood plant	Current Australian ULAB smelter	Nyrstar Port Pirie primary lead smelter	Hydromet Laverton licence limit	Loy Yang A power station	Loy Yang B power station	Yallourn power station	NPI secondary lead emission factor (controlled)
Kilograms per year	274	16	275	58,000	2,628	130	73	150	-
Grams per minute	0.52	0.031	0.52	110	5	0.25	0.14	0.29	-
Ratio of emission per year	17	1	17	3,515	159	8	4	9	-
Gram per tonne of ULABs processed	0.34	0.33	6.0	N/A	N/A	N/A	N/A	N/A	-
Gram per tonne of lead produced	0.61	0.59	11	94	N/A	N/A	N/A	N/A	150

Notes and assumptions:
1. kg/yr figures for all facilities except Chunxing plants and the current Australian ULAB smelter are taken from the National Pollutant Inventory, 2017-18 data
2. Chunxing China plant kg/yr is taken from its 2019 Quarterly report stack test, using supplied Pb results in mg/m^3 and supplied air flows for each stack
3. The current Australian ULAB smelter's emissions are calculated from quarterly monitoring data[3] reports and indicative stack flow estimates (per monitoring point) provided by Enirgi as part of their current EIS process for a plant expansion[4].
4. The current Australian ULAB smelter is assumed to produce 24,000 t/yr lead and alloys from 46,000 t/yr ULAB feedstock (supplied by Engitec Technologies: http://www.engitec.com/en/rmt__pty/)
5. Although not currently in operation, Hydromet Laverton's annual emission is estimated as a theoretical maximum permitted, based on the maximum their licence allows.

[3] EPSR monitoring reports dated July 2018, September 2018, February 2019 and May 2019, available from: http://www.enirgipower.com.au/recycling/recycling-facility/environmental-data/

[4] GHD 2018, *Report for Enirgi Power Storage Recycling - Enirgi Power Storage Recycling Consolidation Project EIS, Response to Submissions*, available at: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6619%2120190307T062507.816%20GMT

Reference to Figure 3 and the ratioing in Table 4 (using the Chunxing Hazelwood plant as a base) shows that the other major ULAB smelter in Australia, itself a modern plant with a similar capacity, is around 17 times higher in lead emissions that what is estimated for Hazelwood. The Chunxing proposal's lead estimate is also significantly lower than the smallest of the coal-fired Latrobe Valley power stations, which are not renowned lead emitters since their input brown coal is very low in lead.

For context, the large primary lead smelter Port Pirie SA, operated by Nyrstar, discharges more than 3,000 times the lead volume of Hazelwood.

It is noted that a blanket comparison of raw emissions does not explain what the actual ground level pollutant impacts would be in any given situation, because stack heights, discharge velocities, topography, meteorology and other receiving environment characteristics differ with each situation. This is what the modelling described in Section 4 is for. But emission load, expressed per tonne of ULABs processed (or tonne of lead produced) as illustrated by Figure 3, is the best way to demonstrate the result of best practice in the plant's emissions performance. On a per tonne of ULAB processed basis, Chunxing's Hazelwood facility is estimated to emit 18 times less lead than the only other current Australian operating ULAB smelter.

Annual emission load estimates for pollutants other than lead are included in Appendix H of the EPA Works Approval application. A direct comparison of the proposed Hazelwood plant's estimated emissions with those from the Wagga Wagga ULAB smelter is provided in Table 5.

Table 5: Comparison of Chunxing emissions to the Wagga Wagga ULAB smelter

Pollutant	Hazelwood plant, kg/year	Wagga plant, kg/year	Comparison	Wagga plant data source
Sulfur dioxide	1,054	40,298	■ (green)	Monitoring
Nitrogen oxides	6,655	31,000	■ (green)	NPI
Total Dust	1,378	2,423	■ (green)	Monitoring
Lead	16	275	■ (green)	Monitoring
Sulfuric Acid Mist	325	793	■ (green)	Monitoring
Chromium	4.3	23*	■ (green)	Monitoring (max total metals)
Arsenic	6.4	23*	■ (green)	
Cadmium	0.3	23*	■ (green)	
Antimony	1.2	23*	■ (green)	
Dioxins and Furans (as TCDD I-TEQs)	0.0000174	0.0000011	■ (red)	Monitoring

■ *Hazelwood plant is estimated to have lower emissions than Wagga plant*

■ *Hazelwood plant is estimated to have higher emissions than Wagga plant*

* *Maximum value possible*

Monitoring = 2018-19 licence monitoring data available from EPSR's website

Monitoring (max total metals) = Sum of 2018-19 licence monitoring data for Sb, As, Cd, Hg, Be, Cr, Co, Mn, Ni, Se, Sn and V, as reported by EPSR on its website

NPI = 2017-18 air emissions data supplied to the National Pollutant Inventory by EPSR.

Table 5 shows that Chunxing's Hazelwood plant is expected to have lower emissions than the Wagga Wagga ULAB smelter for all emissions except dioxins, based on scaled monitoring data from the Chunxing China reference plant (for the former) and (primarily) 2017-18 quarterly monitoring data[5] (for the latter).

The higher dioxin result is, like all Hazelwood estimates, based on a scaled version of the Chunxing China plant's measured emissions. This is expected to be significantly reduced by the removal of input plastics from the furnace feed, which is a design change (from the China plant) that will be adopted at the Hazelwood plant. It is important to note that the China plant's dioxins emissions are still within the international stack emission limit (also adopted by EPA) of 0.1 ng/m^3, despite their inclusion of plastic feedstock to the furnace.

A detailed comparison with all other industrial emitters in the Latrobe Valley, based on 2017-18 data reported to the National Pollutant Inventory (NPI), is provided in Table 6. This comparison shows the contribution the Chunxing plant is expected to make to the Latrobe Valley airshed, for each pollutant, and also shows the three largest emitters per pollutant for reference. Note that the projected emissions from the yet-to-be built Paper Australia energy from waste plant are also included, taken from their EPA Works Approval Application's air quality assessment.

In terms of percentage of the emissions to the Latrobe Valley airshed, including those estimated to come from the proposed Paper Australia energy from waste plant, the Chunxing ULAB smelter will contribute an extremely small proportion of total emissions, ranging from 0.001% of sulfur dioxide up to 2% of arsenic.

[5] http://www.enirgipower.com.au/recycling/recycling-facility/environmental-data/

Table 6: Chunxing emissions in the context of the Latrobe Valley airshed

Pollutant	Hazelwood plant		Jeeralang power station	CHH Sawmill	Loy Yang A power station	Loy Yang B power station	Yallourn power station	New Paper Aust EfW plant
	kg/year	% of LV airshed	% of LV airshed	% of LV airshed	% of LV airshed	% of LV airshed	% of LV airshed	% of LV airshed
Sulfur dioxide	1,054	0.001%	0.001%	0.001%	56%	26%	17%	0.2%
Nitrogen oxides	6,655	0.01%	0.3%	0.01%	43%	27%	26%	1%
PM_{10}	1,378[1]	0.02%	0.06%	0.01%	64%	7%	26%	0.5%
$PM_{2.5}$	1,378[1]	0.06%	0.2%	0.04%	36%	16%	36%	3%[2]
Lead	16	1.19%	0.0001%	0.1%	9%	5%	11%	73%
Sulfuric Acid Mist	325	0.36%	-	-	36%	18%	33%	13%[2]
Chromium	4.3	0.26%	0.00004%	0.02%	32%	20%	17%	27%
Arsenic	6.4	2.3%	0.0002%	0.06%	40%	21%	20%	16%
Cadmium	0.3	0.05%	0.0001%	0.01%	47%	7%	8%	37%
Antimony	1.2	0.53%	-	-	24%	-	-	75%
Dioxins and Furans (as TCDD I-TEQs)	0.000017	0.51%	-	0.2%	9%	28%	47%	12%

Notes:

1. Emission is total dust. For theoretically worse case comparison purposes, total dust has been assumed to be made up entirely of $PM_{2.5}$, and therefore also PM_{10}.

2. No figure was modelled for Paper Australia EfW plant. Figures represent current emission from Paper Australia's pulp and paper operations.

5 Assessment of best practice

The best practice assessment outcomes of the Works Approval application, as they relate to the techniques, processes and technologies employed in the Chunxing proposal are summarised below, primarily from the analysis of segment-relevant best practice sections of the application.

Chunxing's facility is assessed as *meeting best practice in energy and GHG emissions management* because it satisfies a best practice evaluation in each of the following elements:

1. avoidance and reduction of emissions: through life-cycle assessment shows the plant to be a net-reducers of GHG emissions of around -32,118 tonnes CO_2-e per year
2. Its contribution to Latrobe Valley regional GHG emissions and Corporate Australia's emissions are very small, at less than 0.04% of the former.
3. Operating equipment and technologies are highly efficient in their use of energy through automation, plant process enclosures (heat recovery and transfer), furnace design and use of high efficiency three phase induction motors.
4. Chunxing's energy use per tonne of lead produced is higher than conventional smelting alternatives, using approximately 100 kWh per tonne of Pb produced, versus 200 kWh per tonne of Pb produced in reverberate and rotary ULAB furnaces.

Chunxing's facility is assessed as *meeting best practice in air quality management* because it satisfies a best practice evaluation in each of the following elements:

5. Very low emissions compared to the other operational ULAB smelter in Australia, itself deemed best practice technology when installed in approximately 2012. This is due to a combination of unique chemistry and process technologies:
    a) multiple desulfurisation steps
    b) manipulating O_2 concentration in the furnace to first reduce SO_4^{2-} and then subsequently oxidise S^{2-} to SO_2; and final treatment with lime in a high efficiency scrubber
    c) dual Vertical Smelt Furnaces, with pre-heating and continuous stirring, to ensure fast reaction times and efficient stoichiometry, lowering residual (unreacted) lead oxides in the flue gas (the source of lead emission)
    d) and advanced air pollution controls (as described below).
6. Best practice process controls including fully automated, enclosed and negative pressurised environments throughout battery breaking and pre-sorting, melting, smelting, refining, acid neutralisation and by-product purification; fume and off-gas collection, temperature control and high smelting temperatures.
7. Best practice air pollution controls by:
    a) capturing particulates in air discharge with a baghouse (fabric filter) design
    b) removing SO_2 and other pollutants from air emissions with a lime-dosed wet scrubber

8. For class 3 indicators, as part of demonstrating ‘maximum extent achievable’ emission reduction, the plant meets the emissions standards set in the European Union’s Industrial Emissions Directive 2010/75/EU (IED), namely:
    a) <0.5 mg/m^3 for the sum of Sb, As, Pb, Cr
    b) <0.05 mg/m^3 for Cd
    c) <0.1 ng/m^3 for dioxins and furans
9. The plant also meets the IED’s requirements for:
    a) installation of continuous emissions monitoring system (CEMS) for major combustion pollutants
    b) at least non-continuous air emission monitoring of other pollutants such as heavy metals, dioxins and furans
    c) keeping combustion or co-combustion gases at a temperature of at least 850°C for at least two seconds after the last injection of air
    d) Eliminating plastics from furnace feedstock to ensure less than 1 per cent of halogenated organic substances, expressed as chlorine, is combusted.
10. The Chunxing plant's emissions comparison to the only operational ULAB smelter in Australia (the Wagga Wagga facility), shows it to be substantially lower in emissions of most pollutants, including those of primary concern to secondary lead smelting (Pb, SO_2, dust and H_2SO_4 fume).
11. The only pollutant modelled to be a higher emission than the Wagga Wagga facility is dioxins, which the China plant emits below the IED limit (0.1ng/m^3) anyway, and will be significantly lower in the Hazelwood facility due to its decision to exclude feed plastic separators from the furnace.
12. Air quality modelling shows each pollutant’s ground level concentrations to be substantially within SEPP design criteria.
13. All plant emissions are substantially lower than what is currently contributed to the Latrobe Valley airshed (including the projected emissions from the recently approved energy from waste plant at Paper Australia). The major pollutant emissions of concern for secondary lead smelting (Pb, SO_2, H_2SO_4 mist and PM_{10}) contribute only 1.2%, 0.001%, 0.4% and 0.02% respectively of airshed emissions, despite the fact that power generators are relatively low lead emitters due to its low incidence in Latrobe Valley brown coal.

Chunxing’s facility is assessed as *meeting best practice in prescribed industrial waste generation* because it satisfies a best practice evaluation in each of the following elements:

14. Slag volume around 4,500 tonnes/ yr or 160 kg/ slag per t of Pb product; which is much lower than other smelting practices
15. Slag Pb levels around 0.20 – 0.56% Pb; which is much lower than other smelting practices
16. The Chunxing technology rates high against the *wastes hierarchy* because:

a) Chunxing's process is recycling, as opposed to lower-hierarchy options such as breaking/ export, landfilling or illegal dumping outside of the waste system. Lead ingot product and lead alloy products are recycled back into battery manufacturing, for making lead oxide paste and battery plates, respectively.

b) Chunxing also produces four saleable by-products, as a consequence of processing or pollution control, which are recycled:

    a. chipped HDPP back into battery manufacturing for new casings

    b. zinc sulfate solution, for foliage spray, to promote leaf growth in the agricultural sector

    c. ammonium sulfate solution, as a liquid soil fertiliser for the agricultural sector

    d. gypsum, as a soil amendment for Ca/ S nutrition, acid neutralization, water infiltration and P retention.

c) It improves overall Australian environmental outcomes for ULABs by reducing the reliance on overseas export of Pb scrap by as much as 50,000 tonnes/ yr, increasing the Australian ULAB circular economy.

6 Preliminary stakeholder consultation

Various consultation meetings have been undertaken with a range of stakeholders, well-ahead of the public EPA Works Approval assessment process. Outcomes from these consultations are summarised in Table 7.

Responses to the key concerns expressed at community meetings and recorded in Table 7 are detailed in ***Appendix A***.

Table 7: Issues and concern raised by stakeholders

Category	Type	Views raised
Neighbours	Community	Those opposing the proposal raised the following views: - Cautious concern about emissions to the air from the project - Serious concern about lead emissions and their impact on health - Disbelief in the modelling data/ metereological data - Impacts on students of the Hazelwood North Primary School (located 1.6km away) - Concern that no additional 'factories' were welcome in the area, regardless of their impacts - Why does this sort of activity have to be built here – can't it be done overseas? - Concern about the cumulative impact of lead pollution: collecting on rooves, drinking water, land contamination - Impacts to property prices - Visual impacts - Concerns about fire risk and plant malfunction risks, such as explosion - Concerns about worker health at the facility - Can local landfills manage the wastes that will come out of this facility? - Seeking assurance that community monitoring will be carried out (of operating plant) and that it will be made available online - Traffic impacts to Tramway Road: current road condition, fog, impacts on a currently busy road. Those in favour of the the proposal raised the following views: - We need more recycling and forward-looking technology businesses to help regrow the area - We need to encourage high value operations like this – it has potential to bring with it other industries - More jobs are critical to rebuilding the local economy - This project could be a source of low-cost 'battery bank' power (those batteries still in useable condition) to lower power costs in local buildings/ schools and related infrastructure - We are immediately-local residents and we see this as good for the local economy and are comfortable from what we have seen that the emissions will not impact us - The emissions from this plant will be low – there is no comparison between 2020's technology versus 1950s technology - We are interested in direct business opportunities that will come out of this project - As long as the environmental concerns can be assured we are keen for businesses like this to set up in the Valley
	Business	- Neighbouring businesses were very supportive. No concerns about environmental impacts were raised at all - Local business groups were keen to get a form of recycling into the area that could draw on some of the industrial skill base left behind from coal fired power industry closures. - There was a shared view from businesses and their groups that the area was economically depressed and that this project is one of many that need to occur to turn around the local economy.
Government	Regulators	Regulators were keen to ensure strong levels of community participation in the proposal and were interested in gaining updates as the EPA Works Approval Application was developed.
	Other government agencies/ related entities	- Community is wanting us to take responsibility for our own waste, and this would be a positive for the proposal - There will be employment and skill base opportunities - Suitable heavy industry site given its Industrial 2 Zone.
Local representatives	MPs Local Councillors	- Very supportive – the community needs new businesses with new jobs - Good opportunity for skill development and technology partnerships, such as with Fed Uni - Impressed by the level of the technology and emissions control compared to 'old' existing industries in the region

Appendix A

Responses to issues and concern raised by stakeholders

The following issues and concerns (noted in bold) have been raised by community stakeholders during consultation meetings and discussions held in June 2019. Responses are provided below each issue.

1. Concerns raised (from cautious to serious) about lead emissions and their impact on health

Lead exposure can occur via ingestion (food and water), adsorption (due to the direct handling of lead or lead products) or inhalation from lead in the air. Lead is perhaps the most scrutinised emission for this type of plant, given that this metal is the target of recovery in secondary lead smelting, and is long-understood to result in serious health effects at high enough levels of exposure.

It is for these reasons that both regulatory controls and the design of the Chunxing plant (for the protection of workers, nearby people and ecological values) place heavy scrutiny on lead emissions.

The emissions data (at the stack's point of release) presented in the EPA Works Approval application show that the Chunxing plant, once operational, would make up only 1.2% of emissions of lead contributed by large industrial sources in the Latrobe Valley. The vast majority is emitted from coal-fired power generation. This is despite the fact that the Chunxing facility is focused entirely on lead recovery.

Emissions tell only one side of the story, because this occurs at a height and air flow rate; what matters more is the net result of that emission – the predicted ground level concentrations that arise due to the plant's emission. Air quality modelling takes emission inputs and simulates what happens to an emission plume, under a range of meteorological, terrain, environmental and chemistry factors, to ultimately predict what ground level concentrations would result.

The summary of the air quality modelling assessment is that the highest (worst case) ground level concentrations predicted to occur at any point in the domain, for all pollutants modelled, are significantly within Design Criteria limits, typically by a factor of 50 to >100 times. In the case of lead, the worst case ground level concentration identified at any hour in the five years, and within any part of the study domain is 0.000009 mg/m^3 or just 0.31% of the Design Criteria.

These estimates reduce by an order of magnitude at the nearest residence, since dilution of the plume occurs quickly within the first few hundred metres of the emission point. The worst case ground level concentration at the closest sensitive receptor (1.1km away) is 0.000002 mg/m^3 or 0.07% of the Design Criteria.

These results are extremely low, to the point of being beneath the levels of detection of field monitoring instruments. To put it in perspective, the plant's emissions at this 1.1km distance could be 1,500 times higher (in lead) before the EPA limit to protect human health would be breached. Put another way, in theory at least, 1,500 identical (50,000 tonne) Chunxing plants could be placed at that particular location before lead Design Criteria levels were exceeded at the nearest residence or school.

Victoria, like other states, phased out lead in petrol - the regulatory ban was from the end of 2001, but emissions had been progressively lowering since the introduction of the catalytic convertor in 1986. By 2002, according to the Victorian Auditor General "levels of lead in the Latrobe Valley are so low that it is no longer monitored on an ongoing basis."[6] Prior to the phase out they were as high as 0.001 mg/m^3 in ambient air in Melbourne and Adelaide in the 1980s, or anywhere where car traffic densities were high. By the early 2000s these ambient levels had dropped to as low as 0.00002 mg/m^3 [7], which prompted all states and territories to discard the requirement for ambient air quality monitoring of lead.

Current day monitoring data for lead in the Latrobe Valley is not available, but data exists for the cities. The worst-case emission-hour predicted to occur at the closest sensitive receptor point 1.1km away from the Chunxing Hazelwood North plant (0.000002 mg/m^3) would still be 10-fold lower than 2003 ambient levels in Melbourne, Adelaide and likely any other Australian capital, levels deemed too low to continue regulatory monitoring.

As a final means of comparison, levels of emission of lead at the nearest sensitive receptor can be compared to other exposure routes, such as simply eating or drinking.

Potential lead intake via breathing ambient air at the closest residence

The worst case ground level concentration at the closest sensitive receptor (1.1km away) is 0.000002 mg/m^3.

The average adult, when resting, inhales and exhales about 7 or 8 litres of air per minute[8]. That totals about 11,000 litres of air per day, or 11m^3. At 0.000002 mg/m^3 lead, this equates to a theoretical maximum of 0.00002 mg of lead inhaled from breathing per day at the closest residence.

Chunxing lead intake at closest residence v potential intake via drinking water

Gippsland Water advises that lead can be present in drinking water as a result of dissolution from natural sources or from household plumbing. Based on health considerations in the Australian Drinking Water Guidelines, concentrations of lead in drinking water should not exceed 0.01 mg/L. Gippsland Water sites achieved this 100% of the time in 2015-16 for all customer tap sites. Gippsland Water's 2015-16 Annual Report on Drinking Water Quality[9] did however report instances of measurable lead levels in drinking water supplies in 2015-16. A maximum level of 0.002 mg/L was measured for a town supply very close to the plant location.

Health authorities commonly recommend drinking about eight 8-ounce glasses of water a day, which equals about 2 litres. If this was from a supply at 0.002 mg/L lead, this would equate to 0.004 mg of lead ingested per day from drinking tap water at this level. Comparing this to breathing air at the closest residence (a maximum of 0.00002 mg of lead inhaled per day)

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[6] Auditor General Victoria (2002), *Managing Victoria's air quality*, available at: https://www.parliament.vic.gov.au/papers/govpub/VPARL1999-2002No155.pdf

[7] Environment Protection Authority Government of South Australia (2003), *Future Air Quality Monitoring for Lead in Metropolitan Adelaide - a report to the National Environment Protection Council*, available at: https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiuoZmm_8_jAhVB7XMBHYhxAVoQFjAAegQIARAC&url=https%3A%2F%2Fwww.epa.sa.gov.au%2Ffiles%2F477255_lead_aq_report.pdf&usg=AOvVaw3Y0hIDlkQA9qaxGjMRxnKl

[8] Sharecare medical health website, available at: https://www.sharecare.com/health/air-quality/oxygen-person-consume-a-day

[9] Gippsland Water 2015-16 Annual Report on Drinking Water Quality, available at: https://www.gippswater.com.au/application/files/7114/7752/4332/SDWA_Annual_Report_on_Drinking_Water_Quality_2015-2016_.pdf

suggests that the impact 1.1km from the Chunxing plant is potentially greater from drinking town water at the recommended daily rate, potentially by as much as 200 times.

It is important to stress that drinking water in the Latrobe Valley, like most places in Australia, is very safe, is not contaminated in lead and was measured to contain levels of lead well below health standards 100% of the time during 2015-16. This example illustrates how low the Chunxing-derived air lead ground level concentration is at these locations, not how high drinking water is contaminated.

Chunxing lead intake at closest residence v potential intake via food

Diets vary widely but, since our lifestyle and environment is not utopian, some levels of heavy metals such as lead can be present in foods we eat, albeit at exceedingly low levels. The US Agency for Toxic Substances and Disease Registry (ATSDR), via the Food and Drug Administration (FDA), has set an action level of 0.5 µg/dL (5 µg/L) for lead in food products intended for use by infants and children and has banned the use of lead-soldered food cans. These levels are based on FDA calculations of the amount of lead a person can consume without ill affect.

American Dietary Reference Intake (DRI) suggests a protein intake for the average sedentary man of 56 grams per day, and 46 grams per day for the average sedentary woman[10]. Obviously there are many other components of diet than proteins, but lead has been reported as present in raw protein rich foods such as milk, eggs, neat and fish[11], at least in decades past.

Given that the ATSDR/ FDA level for foods for infants and children is very stringent, this figure is assumed as the maximum that can be legally present in food. If only the protein component of food intake is considered and assuming food density of 1kg/L, then a legal maximum of lead that could be consumed in this part of an average diet would be:

0.051 kg (protein) x 5 µg (lead)/kg (protein) = 0.255 µg lead = 0.000255 mg lead per day (legal maximum). This is 13 times higher than amount taken in from breathing (0.00002 mg) at the nearest residence (1.1km from the plant).

In other words, fully safe and legal consumption of food could result in ingesting lead at a daily rate more than 10 times that from breathing air at the nearest residence. As with the example of ingesting lead from drinking, this comparison is not to infer there is anything whatsoever wrong or unsafe with eating food (in terms of lead impacts), rather to illustrate how low the risk is from the maximum level of lead modelled in the air 1.1 km from the Chunxing operation.

2. Disbelief in the modelling data/ meteorological data

All air quality modelling has followed strict EPA protocols, including the use of the EPA approved model (AERMOD), the use of five years of local meteorological data (often one year is deemed sufficient), terrain files and the inclusion of background data from the nearest ambient monitoring station that had been operating for the full duration of the assessment period (Morwell East).

[10] Healthline.com website, available at: https://www.healthline.com/nutrition/how-much-protein-per-day

[11] Jelinek CF, *Levels of lead in the United States food supply*, J Assoc Off Anal Chem. 1982 Jul;65(4):942-6, available at: https://www.ncbi.nlm.nih.gov/pubmed/7118801

The process of air quality modeling is incredibly conservative. Regulatory comparisons are made using the worst-modelled ground level concentration – a single hour's result out of 43,800 discrete hours of data across the five year period, spread across a 5km x 5km geographical study area (438 million data points, for each pollutant modelled). This is rarely reached, but the assessment practice is to take this worst-case figure and assume it was occurring 24 hours a day every day, and compare it against the Design Criteria level of the SEPP(AQM) (the regulatory limit).

All emissions modelled meet the Design Criteria with a large margin of comfort, with results ranging from 0.01% (of the Design Criteria) for antimony through to 3.99% for arsenic.

3. Impacts on students of the Hazelwood North Primary School (located 1.6km away)

See response to '1', in particular the analysis of ground level concentrations at the nearest sensitive receptor (1.1km away). The Hazelwood North Primary School is 1.7km away, and the worst-case emission-hour predicted to occur at the school is 0.000002 mg/m^3 for lead, which is equivalent to other sensitive receptors discussed under '1'.

4. Concern that no additional 'factories' were welcome in the area, regardless of their impacts

This is not a criteria that is weighted towards environmental assessment, so no response is provided.

5. Why does this sort of activity have to be built here – can't it be done overseas?

The location of the proposal was based on many factors, as described in the Works Approval application. Australia's current ULABs are either sent to the ULAB smelter in Wagga Wagga or sent overseas, usually via 'battery breaker' plants located in NSW and Qld, who export lead scrap rather than whole batteries.

Australia is a signatory to the international (multilateral environmental agreement) known as the Basel Convention. One of the aims of the convention is that countries should manage the hazardous waste they produce in an environmentally sound manner, preferably within their boundaries and that export should only occur under strictly permitted conditions and not to developing countries. Recycling of ULABs via environmentally permitted secondary smelting is not only environmentally sound but ensures that lead does not enter the environment in levels that could cause both short and long-term harm. The economics of lead enable this recycling to be commercially viable.

Australia, as a first-world country, is obligated to manage its own wastes, wherever that is technologically possible. Having capable infrastructure onshore is vital in the event of situations like the China Sword decision to halt imports of waste, such as Australia's, which left the Australian (non-hazardous) waste recycling market is disarray, resulting in greater volumes of recyclables going to landfill. Should a similar situation occur for ULABs, the consequences of landfilling or otherwise uncontrolled dumping of ULABs could be environmentally disastrous.

6. Concern about the cumulative impact of lead pollution: collecting on rooves, drinking water, land contamination

EPA's Design Criteria are set protect human health against impacts from breathing pollutants such as lead in ambient air. These take into effect cumulative impacts, as they are predicated on that exposure occurring 24 hours a day for a lifetime.

Emissions from the Chunxing plant are modelled to be so low at sensitive receptor locations that they would be indistinguishable from current background concentrations. This means that, due to the combination of low emissions and large atmospheric dilution, cumulative levels falling on surfaces such as rooves and soil in residential locations will be too low to be measurable.

7. Impacts to property prices

It is difficult to answer this question as it is neither within the expertise of the author or part of the assessment of environmental impacts. The Chunxing plant will be a state of the art industrial facility so will look somewhat different to the older industrial premises nearby. The China reference plant is very large, and is part of a technology park which contains other businesses, including a battery manufacturing plant on the Chunxing site itself. Figure 4 and Figure 5 show what the site in China looks like, which is an indication of the type of 'look' the Hazelwood facility would have, but on a dramatically smaller scale.

8. Visual impacts

The Chunxing plant will be a state of the art industrial facility so will look somewhat different to the older industrial premises nearby. The China reference plant is very large, and is part of a technology park which contains other businesses, including a battery manufacturing plant. Figure 4 and Figure 5 show what the site in China looks like, which is an indication of the type of 'look' the Hazelwood facility would have, but on a dramatically smaller scale.

Figure 4: Jiangsu New Chunxing Resource Recycling plant in Pizou, Jiangsu Province, China (front entrance)

Figure 5: Jiangsu New Chunxing Resource Recycling plant in Pizou, Jiangsu Province, China (aerial view)

9. Concerns about fire risk and plant malfunction risks, such as explosion

The raw materials used for secondary lead smelting, including the lead-acid batteries themselves, are not flammable. The plant will use natural gas to fire the furnaces however. Concerns about plant malfunction impacts are described the Works Approval application section using a potential plant upset risk identification process. These are controllable and minor, because:

- The thermal aspects of the plant are batch-driven (not continuous), which means the scale of any one production batch is relatively small, and repeated over and over. Furnaces are dimensionally small compared to plant like power station boilers, which allows processes to be stopped rapidly (immediate switching off of gas fuel) in the event of a problem, and processes brought to cool (ambient) temperatures quickly.

- Plant processes occur in highly automated and fully enclosed environments, which limits the possibility of manual intervention/ mistakes, as well as provides higher levels of safety and lower levels of exposure to plant staff.

10. Concerns about worker health at the facility

Worker health and safety does not directly form part of this (environmental) assessment. However, the Works Approval Application's plant upset risk identification process identifies worker health impacts from lead as a risk.

The potential for lead exposure to workers is common to mining, mine processing, smelting, casting, foundry and abrasives blasting industries. Consequently, strict health and safety requirements exist in Australia to minimise exposure in the work place: https://www.safeworkaustralia.gov.au/topic/lead.

Chunxing staff begin their shift by changing into new uniforms, which are then removed at the end of the shift, where showering and laundering occur onsite. Similar procedures apply for hygiene for breaks and meals during work hours.

The plant is heavily automated. Key work areas are controlled by enclosure and negative pressure to minimise worker exposures. In addition, strict PPE requirements apply during work tasks.

Lead blood tests are carried out before employees commence the work, one month after starting and at regular intervals thereafter. Chunxing adopt a safe level of 2 μg/dL, which is significantly lower than levels required by SafeWork Australia. Workers with blood lead levels above this will be removed from lead-risk work until such time as these levels drop well below them, with regular monitoring to determine this.

There are strict rules under company policy on smoking, alcohol and drug using which will also be monitored in the premises.

11. Can local landfills manage the wastes that will come out of this facility?

Yes. It is likely that most of the waste (the slag) will need to be sent to Suez's Lyndhurst Category B prescribed industrial waste landfill. Both the waste's hazard and volume are well within the capability and capacity of this facility. Waste volumes are low compared to comparable operations elsewhere, such as from the facility in Wagga Wagga.

12. Seeking assurance that community monitoring will be carried out (of operating plant) and that it will be made available online

Potential pollutants such as SO_2, N_2O, and particulates from the melting, desulfurisation, smelting and refining processes are monitored through a continuous emissions monitoring system (CEMS). Since lead is emitted in solid form there is a direct relationship between dust (particles) measurement/ emission and lead emission.

In addition, the above pollutants and others such as sulfuric acid mist, chromium, arsenic, cadmium, antimony and dioxins are measured on a quarterly or annual basis at the China plant, by independent stack testing samplers and laboratories, with reporting required against compliance with local environmental limits. The same monitoring approach will apply to the Hazelwood plant.

Chunxing have committed to providing real time access to the CEMS monitoring data online to the public. They are also investigating the possibility of deploying community monitoring stations in the local area around the site, accessible by the public online, which could measure for lead and other pollutants of concern. One option to enable this is to collaborate with an existing resource, such as EPA monitoring stations (EPA AirWatch)[12], Latrobe Valley Air Monitoring Network (LVAMN)[13] or the recently established Latrobe Valley Information Network (LVIN)[14].

13. Traffic impacts to Tramway Road: current road condition, fog, impacts on a currently busy road.

Traffic impacts from the project are discussed in the EPA Works Approval application. Total trucks that would arise from the operational phase of the plant are estimated at 12 per day. For comparison purposes, Paper Australia's Energy from Waste Works Approval Application Health Impact Assessment[15] estimated an additional 100 vehicles per day from that project once operational. The assessment concluded that, at this rate of truck movements, ""… the number of vehicles added by (the energy from waste) development will have a minimal traffic impact upon the local road network" and that "… no significant reduction in travel times is

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[12] https://www.epa.vic.gov.au/our-work/monitoring-the-environment/epa-airwatch
[13] http://lvamninc.com.au
[14] https://lvin.org/#/
[15] Environmental Risk Sciences 2018, *Maryvale Energy from Waste Plant: Health Impact Assessment*, prepared for Paper Australia and Jacobs, available at: https://cvws.icloud-content.com/B/Aake9PWyiL1PJdqIDz75iLJErXtqAextOvMoXlzr2Q7AvOWYn4xdmJpq/Images.zip?o=ArNXCuMgT5ASfoNcOR8bL-bNZKOGMPNtBSpNdkdfVxqD&v=1&x=3&a=CAoguU0URZY8UgE6wgoON5vAN_zSfUZgU9q77p40faGc4CASJxC3hLfeui0Yt5SyssQtIgEAKggByAD_IfCUYVIERK17aloEXZiaag&e=1564547516&k=xWkbe0L5axdbN3FDcJeYXg&fl=&r=22CEF7E9-A909-4A02-A74F-C81A4A110595-1&ckc=com.apple.largeattachment&ckz=A78ECDBE-21B4-405F-B0A6-50AC63EBE1E4&p=44&s=KFHVQAuQMcBmzNXJDhltbWXYDXE&teh=1

expected". The estimate for Hazelwood is 10-fold below that estimated for Paper Australia's EfW plant.

Since battery volumes will be coming from Melbourne they will travel on the Princes Freeway then are likely to turn onto Monash Way, Firmins Ln, Tramway Rd and finally turn right onto Fourth Rd.

14. What is the source of the water for use in the plant?

The primary source of water is recycled from the onsite wastewater treatment system, which is fed by the liquids in the batteries themselves (about 12-15% of the ULAB is dilute sulfuric acid) and collected rain and stormwater on the site. If there is a requirement excess to what is available from the recycling circuit it will be drawn from mains supply, but this is not expected to exceed 5m^3 per day (equivalent to less than 10 households' water use). This could occur during prolonged dry spells.

15. What quantity of water is drawn for ongoing processing?

The maximum volume likely to be drawn from the mains supply, based on rainfall records, would be about 5kL (5m^3) per day, which is equivalent to about 10 households' daily water use. It is likely that much of the time there will be a water excess from site operations, which will be stored for later use or discharged to trade waste if necessary.

16. What height is the stack?

Maximum height is 30m.

17. In your assessments do you incorporate the projected emissions form the proposed waste incinerator at APM?

Yes. All emission estimates and comparisons include the contribution from existing industrial sources plus the proposed emissions from the Paper Australia Energy from Waste plant, on the basis that it will be in operation when the Chunxing plant is up and running. These Paper Australia EfW plant emissions are taken from those indicated in their Works Approval Application.

Chunxing's proposed Hazelwood plant's emissions are provided alongside other emission sources in Latrobe Valley, including those predicted from Paper Australia's proposed plant, in Table 6 of this summary document.