

ATTACHMENT 4

16B0104-E0066, Attachment 4

Gunns Limited
Bell Bay Pulp Mill Project
Tasmania

In the matter of the Bell Bay Pulp Mill Project: A project of State Significance
Resource Planning and Development Commission inquiry

Proponent: Gunns Limited

SOLID WASTE STREAMS

Generated solid waste

Total amount of generated solid waste is specified in Jaakko Pöyry report 16B0104-E0035, Volume 7, Appendix 9, as Annex VII “Solid waste amounts”. The solid waste amounts are

Solid Waste			
Pulp Production, ADt/a	1100000 d/a		350 d/a
Amount	actual t/a	Dry solids	BDt/a
Power boiler ash	8509	70 %	5957
Green liquor dregs	16000	55 %	8800
Slaker sand	12222	45 %	5500
Lime kiln ESP dust	11786	100 %	11758
Total	48517	71 %	32014

In the calculation of the above table it has been assumed that

1. Wood waste and bark is burned in the Power Boiler and the ash is disposed of to the landfill. Power boiler ash contains nutrients from the forests and is sometimes used in forests as fertiliser.
2. Screening and cleaning rejects are burned in Power Boiler.
3. Green liquor dregs is disposed to landfill.
4. Slaker sand is disposed to landfill.
5. Lime kiln (“ESP”) dust is disposed to landfill. Lime kiln ESP dust is almost pure CaO and is often sold as fertilizer.
6. Recycleable waste (scrap metal, office paper, etc.) is not landfilled.
7. Canteen and sanitary waste is excluded from above table.

Dioxins and Furans in Power Boiler Ash

The amount of dioxins and furans in the Power Boiler ash can be estimated ¹as:

I-TEQ-Emission with Power Boiler			
Bottom Ash Amount, BDt/a	Ash	1.93 %	5957
	Bott. ash	30 %	1787
	Fly ash	70 %	4170
I-TEQ-Emission Factors, micro-g/BDt	Bottom ash		0.02
	Fly ash		0.46
I-TEQ-Emission, g/a			0.0020
I-TEQ-Emission, micro-g/ADt			0.0018

The estimated volume of 0.0020 g/a as I-TEQ of dioxins and furans in the Power Boiler ash is conservative because it is based on medians of samples for various power boiler ashes, some containing salt laden wood, some not. Bell Bay does not burn salt laden logs. New measurements done after establishing the previous limits show lower values². The change to previous measurements can be attributed to the fact that some mills have retrofitted their boilers and that some of the oldest boilers were shut down. Data from newest technology should be lower than the estimates outlined above. However, for the purpose of this document I have taken a precautionary approach and not taken account of the trend toward lower levels of dioxins and furans in power boiler ash.

Dioxins and Furans in Green Liquor Dregs

The amount of dioxins and furans in the green liquor dregs can be estimated ³as:

I-TEQ-Emission with GL Dregs	
Total dregs Amount, BDt/a	8800
I-TEQ-Emission Factors, micro-g/BDt	Green liquor dregs
	0.02
I-TEQ-Emission, g/a	0.0002
I-TEQ-Emission, micro-g/ADt	0.0002

The dioxins and furans emission rate of 0.0002 g/a as I-TEQ for the Green Liquor Dregs is conservative because:

- the emission rate assumes the use of older equipment. Newer processes, such as the use of centrifuges instead of dregs filtration, should ensure that the amount of dioxins and furans in green liquor dregs could be as low as half the of the estimate given above; and

¹ Uloth and van Heek, 2002

² Jurisdictional Interim Progress

³ Precautionary value Uloth et. al. report one measurement that showed a trace

- A precautionary value based on Uloth and van Heek, 2002 has been used to calculate the dioxin and furan quantities in green liquor dregs. Uloth and van Heek did three measurements. Two failed to show presence of dioxins and furans. Only one measurement showed 'a trace', clearly below detection limit of their measurements. Their detection limit of 0.02 µg/t for dioxin and furan content is used here for estimating the dioxin and furan quantities in green liquor dregs.

Dioxins and Furans in Slaker Sand

The amount of dioxins and furans in the slaker sand can be estimated ⁴as:

I-TEQ-Emission with Slaker Sand	
Total slaker sand Amount, BDt/a	5500
I-TEQ-Emission Factors, micro-g/BDt Slaker sand	0.02
I-TEQ-Emission, g/a	0.0001
I-TEQ-Emission, micro-g/ADt	0.0001

The dioxins and furans emission rate of 0.0001 g/a as I-TEQ for the Slaker Sand is conservative because:

- the estimated amount of slaker sand is conservatively high. Most of the material flow comes from impurities in purchased lime and, unlike ash, is not formed during combustion; and
- a precautionary detection limit value from Uloth and van Heek, 2002 for dioxin and furan level has been used. No reported measurements have been found from professional literature indicating dioxin and furan presence in slaker sand.

Dioxins and Furans in Lime Kiln ESP Dust

The amount of dioxins and furans in the Lime Kiln ESP dust can be estimated ⁵as:

I-TEQ-Emission with Lime Kiln Dust	
Total lime kiln dust Amount, BDt/a	11758
I-TEQ-Emission Factors, micro-g/BDt Lime kiln dust	0.02
I-TEQ-Emission, g/a	0.0002
I-TEQ-Emission, micro-g/ADt	0.0002

The dioxins and furans emission rate of 0.0002 g/a as I-TEQ for the Lime Kiln ESP Ash is conservative because:

- it assumes that all of this waste is land filled, even though there is potential for this waste to be re-used as fertilizer; and

⁴ Precautionary value as no measurements

⁵ Precautionary value as no measurements

- a precautionary detection limit value from Uloth and van Heek, 2002 for dioxin and furan level has been used. No reported measurements have been found from professional literature indicating dioxin and furan presence in lime kiln ESP dust.

Dioxins and Furans in Solid Waste to Landfill

The total amount of dioxins and furans in the solid waste that has been assumed will be disposed of to landfill is the sum of dioxins and furans in all of the solid waste streams described above:

I-TEQ-Emission Total to Solid Waste	
Total waste Amount, BDt/a	32014
I-TEQ-Emission, g/a	0.0025
I-TEQ-Emission, micro-g/ADt	0.0022

Amount of Dioxins and Furans in Leachate

The total amount of dioxins and furans in the leachate is low, as they are not soluble in water⁶. Consequently, only small amounts of dioxins and furans in the leachate will result.

I-TEQ-Emission from Landfill in Leachate	
Total leachate Amount, l/a	2555000
I-TEQ-Emission Factors, pg/l	5
I-TEQ-Emission, g/a	0.00001
I-TEQ-Emission, micro-g/ADt	0.00001

The dioxins and furans emission rate of 0.0005 g/a as I-TEQ for the leachate is conservative because:

- the level of 5 pg/l was used even though 30 of the 47 samples measured in Uloth et al 2005 were either completely non-detectable or contained less than 5 pg TEQ/l; and
- the value for power boiler ash leachate is used even though only part of the leachate drains through power boiler ash. Leachate draining through materials with lower dioxin and furan contents could be assumed to result in lower end level.

It should be remembered that all leachate will be pumped to the waste water treatment plant.

⁶ Uloth et al., 2005

REFERENCES

- Jurisdictional Interim Progress in Achieving Dioxins and Furans Canada-Wide Standards for: Pulp and Paper Boilers Burning Salt Laden Wood, Waste Incineration, Iron Sintering Plants and Steel Manufacturing Electric Arc Furnaces, 2004, [df_2004_prgs_rpt_e.pdf](#)
- “Release of Dioxins and Furans from Pulp Mill Wood Residue Power Boiler Ash” prepared by CANTOX Environmental for Environment Canada, December 2000. as cited in Investigations into the Variability and Control of Dioxins Formation and
- Uloth, V., Wenli, D., Leclerc, D., Karidio, I., Kish, J and Singbeil, D., 2005, Investigations into the variability and control of dioxins formation and emissions from coastal power boilers. Technical Association of the Pulp and Paper Industry - Engineering, Pulping, and Environmental Conference 2005.
- Uloth, Vic and van Heek, Ron, 2002, Dioxin and furan emission factors for combustion operations in pulp mills. NPRI Guidance document, http://www.ec.gc.ca/pdb/npri/2002guidance/dioxin2002/dioxin_combustion_e.cfm.