

**TECHNICAL MEMORANDUM****DATE** 20 January 2020**Reference No.** 1667000-189-M Rev0**TO** Barro Group Pty Ltd**FROM** Golder Associates**EMAIL** mtulau@golder.com.au**BARRO SUNSHINE LANDFILL – VOLATILE ORGANIC COMPOUNDS (VOC) MONITORING RESULTS**

Barro Group Pty Ltd (Barro) engaged Golder Associates (Golder) to undertake boundary monitoring for volatile organic compounds (VOCs) at 2 locations along the Barro Sunshine Landfill (the site) boundary following the identification of a hotspot in Cell 5 North. The following technical memorandum presents the results from sampling conducted between the 24<sup>th</sup> December 2019 and 3<sup>rd</sup> January 2020.

**Sampling Location**

Monitoring for VOCs was undertaken at two locations using summa canisters, located near the western boundary (“West”) and northern boundary (“North”). These locations were chosen to best represent ambient air quality conditions at neighbouring residential properties. Details of the monitoring locations and corresponding siting assessment against criteria contained in AS3580.10.1 are presented in Table 1.

**Table 1: Monitoring locations – VOCs by evacuated canister**

Siting requirements (AS 3580.1.1)	Location ID	
	West	North
Co-ordinates (AMG)	308579, 5820432	3087310, 5820691
Clear sky angle 120 <sup>o</sup>	✓	✓
Unrestricted air flow of 270 <sup>o</sup> around sample inlet or 180 <sup>o</sup> if inlet is on side of building	✓	✓
Height above ground to probe 2 m – 15 m	✓	✓
≥2 m from road	✓	✓
10 m from any object with a height exceeding 2 m below the height of sample inlet	X*	X*
No extraneous sources nearby	✓	✓

NOTE: \* trees are located approximately 8 meters from the monitoring locations and are situated on the far side of the monitor to the landfill

The location of the North and West summa canisters does not meet all the siting criteria contained in AS3580.10.1 due to trees located near the site boundary. The presence of nearby trees is a common non-compliance for ambient air quality monitoring sites, however for the purpose of the monitoring it is considered satisfactory.

**Sampling Methodology**

The sampling for VOCs was in accordance with Golder Associates Test Method C9 “*Canister (Evacuated) Sampling for VOC and Reduced Sulphur compounds: In Ambient Air and Source Emissions*”.

Sampling was undertaken by collecting whole air samples in electro-polished (SUMMA) stainless steel canisters fitted with a flow restricting device. 6L canisters were used to sample a 24-hour period. The canister is under negative pressure and when opened, slowly draws a whole air sample into the canister. The canister is closed at the end of the monitoring period, while still under a negative pressure.

Sample analysis was conducted by Gas Chromatography / Mass Spectrometry (GC/MS) in accordance with USEPA Method TO-15. The method uncertainty varies with the level of component detected and has been reported between 25.5% and 47.4%.

Sampling was conducted by Golder Associates (NATA Laboratory accreditation No. 1910). Sample analysis was conducted by SGS (NATA Laboratory Accreditation No. 2562)

## Results

Volatile organic compound results above the limit of reporting (LOR) for the sampling conducted between the 5 January 2020 and 8 January 2020 and are presented in Table 2. A complete list of volatile organic compound analysed are presented in Appendix A.

**Table 2: Results: VOCs by evacuated canister**

Site	West	North	West
<b>Sample No</b>	20-059	20-060	20-061
<b>Sample start</b>	5/01/2020 09:15	5/01/2020 09:34	8/01/2020 13:40
<b>Sample end</b>	6/01/2020 08:54	6/01/2020 08:34	9/01/2020 13:40
<b>Compound</b>	<b>Concentration <math>\mu\text{g}/\text{m}^3</math></b>		
Benzene	2.5	17	3.1
Ethylbenzene	<2.6	4.6	<2.9
Freon 11	2.5	2.7	2.5
Freon 12	5.6	5.7	6.0
Toluene	3.0	7.2	2.9

Samples 20-059, 20-060 and 20-061 collected between the 5<sup>th</sup> to 8<sup>th</sup> January 2020 have reported benzene, toluene, freon 11 and freon 12 concentrations above the limit of reporting (LOR). Sample 20-060 collected on the 5<sup>th</sup> January 2020 had a reported ethylbenzene concentration above the LOR.

The SEPP(AQM) sets out statutory requirements for managing and assessing air emissions in Victoria. The aim of the SEPP(AQM) is to ensure that prescribed air quality objectives are met and protect the beneficial uses of the air environment. Schedule B of the SEPP(AQM) lists intervention levels which are used in the assessment of local or neighbourhood air monitoring data. Schedule B specifies criteria as a 1-hour average and are therefore, not directly comparable to the monitored concentrations collected over a 24-hour period.

Twenty-four hour criteria have been derived using the EPA Victoria recommended method outlined in EPA Victoria Publication 1551.

All reported results are below the derived 24-hour average criteria for benzene (40 µg/m<sup>3</sup>) and toluene (1000 µg/m<sup>3</sup>).

There are currently no Victorian or National ambient air quality objectives for ethylbenzene, freon 11 or freon 12.

### **Important information relating to this report**

Your attention is drawn to the document, *Important Information Relating to this Report* (LEG04, RL2), which is contained in Appendix B. The statements presented in this document are intended to advise you of what your realistic expectations of this letter should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this letter are aware of the responsibilities each assumes in so doing. We would be pleased to answer any questions the reader may have regarding this document.



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**APPENDIX A**

**Lab Results**

**Appendix A - Volatile Organic compounds**

Location	West	North	West
Sample No	20-059	20-060	20-061
Sample Date	5/01/2020	5/01/2020	8/01/2020
Compound	Concentration ( $\mu\text{g}/\text{m}^3$ )		
Acrolein	<3	<3.3	<3.4
Acrylonitrile	<7.7	<8.4	<8.7
tert-Amyl Methyl Ether	<2.6	<2.8	<2.9
Benzene	2.5	17	3.1
Bromodichloromethane	<4.3	<4.7	<4.8
Bromoform	<5.2	<5.6	<5.8
Bromomethane	<3.9	<4.2	<4.4
1,3-Butadiene	<1.3	<1.4	<1.5
2-Butanone (Methyl Ethyl Ketone)	<2.2	<2.3	<2.4
tert-Butyl Alcohol	<2.2	<2.3	<2.4
n-Butylbenzene	<3.4	<3.7	<3.9
sec-Butylbenzene	<3.4	<3.7	<3.9
tert-Butylbenzene	<3.4	<3.7	<3.9
Carbon Tetrachloride	<4.3	<4.7	<4.8
Chlorobenzene	<2.6	<2.8	<2.9
Chloroethane	<2.6	<2.8	<2.9
Chloroform	<3.9	<4.2	<4.4
Chloromethane	<3	<3.3	<3.4
2-Chloroprene	<4.7	<5.1	<5.3
3-Chloropropene	<3	<3.3	<3.4
2-Chlorotoluene	<3.9	<4.2	<4.4
alpha-Chlorotoluene	<3	<3.3	<3.4
Cumene	<3.4	<3.7	<3.9
Cyclohexane	<1.7	<1.9	<1.9
o-Cymene	<3.4	<3.7	<3.9
Dibromochloromethane	<5.2	<5.6	<5.8
1,2-Dibromoethane (EDB)	<5.2	<5.6	<5.8
1,2-Dichlorobenzene	<5.6	<6	<6.3
1,3-Dichlorobenzene	<5.6	<6	<6.3
1,4-Dichlorobenzene	<5.6	<6	<6.3
1,1-Dichloroethane	<3	<3.3	<3.4
1,2-Dichloroethane	<4.3	<4.7	<4.8
1,1-Dichloroethene	<2.6	<2.8	<2.9
cis-1,2-Dichloroethene	<3.4	<3.7	<3.9
trans-1,2-Dichloroethene	<2.6	<2.8	<2.9
1,2-Dichloropropane	<7.7	<8.4	<8.7
cis-1,3-Dichloropropene	<2.6	<2.8	<2.9
trans-1,3-Dichloropropene	<3	<3.3	<3.4
Diisopropyl Ether	<3	<3.3	<3.4
1,4-Dioxane	<2.6	<2.8	<2.9
Ethyl Acetate	<3.4	<3.7	<3.9
Ethyl Benzene	<2.6	4.6	<2.9
Ethyl tert-Butyl Ether	<2.2	<2.3	<2.4
4-Ethyltoluene	<2.6	<2.8	<2.9
Freon 11	2.5	2.7	2.5
Freon 113	<4.3	<4.7	<4.8

**Appendix A - Volatile Organic compounds**

Location	West	North	West
Sample No	20-059	20-060	20-061
Sample Date	5/01/2020	5/01/2020	8/01/2020
Compound	Concentration ( $\mu\text{g}/\text{m}^3$ )		
Freon 114	<1.3	<1.4	<1.5
Freon 12	5.6	5.7	6
Heptane	<3	<3.3	<3.4
Hexachlorobutadiene	<8.6	<9.3	<9.7
Hexane	<2.6	<2.8	<2.9
2-Hexanone	<2.6	<2.8	<2.9
m,p-Xylene	<5.6	<6	<6.3
Methyl Methacrylate	<3	<3.3	<3.4
Methyl tert-butyl ether	<2.6	<2.8	<2.9
4-Methyl-2-pentanone	<2.6	<2.8	<2.9
Naphthalene	<9	<9.8	<10
2-Propanol	<43	<47	<48
Propene	<4.3	<4.7	<4.8
Propylbenzene	<3	<3.3	<3.4
Styrene	<2.6	<2.8	<2.9
1,1,1,2-Tetrachloroethane	<4.3	<4.7	<4.8
1,1,2,2-Tetrachloroethane	<3	<3.3	<3.4
Tetrachloroethene	<4.7	<5.1	<5.3
Tetrahydrofuran	<1.7	<1.9	<1.9
Toluene	3.1	7.2	2.9
1,2,4-Trichlorobenzene	<15	<17	<17
1,1,1-Trichloroethane	<3.4	<3.7	<3.9
1,1,2-Trichloroethane	<3.4	<3.7	<3.9
Trichloroethene	<3.9	<4.2	<4.4
1,2,4-Trimethylbenzene	<3.4	<3.7	<3.9
1,3,5-Trimethylbenzene	<2.6	<2.8	<2.9
2,2,4-Trimethylpentane	<3.9	<4.2	<4.4
Vinyl Acetate	<3	<3.3	<3.4
Vinyl Bromide	<3.4	<3.7	<3.9
Vinyl Chloride	<1.7	<1.9	<1.9
o-Xylene	<2.6	<2.8	<2.9

Results expressed as micrograms per cubic metre of air at 0°C and 101.325 kPa

Analysis conducted by SGS (NATA Laboratory Accreditation Number 2562).

Analysis conducted on 15/01/2020, Report No M201825

**APPENDIX B**

**Important Information Relating to  
This Report**

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

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Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

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**Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification**