

**TECHNICAL MEMORANDUM****DATE** 28 January 2020**Reference No.** 1667000-194-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 on the 22<sup>nd</sup> to 23<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 report 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 on the 22<sup>nd</sup> to 23<sup>rd</sup> January 2020 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
<b>Sample No</b>	20-120	20-121
<b>Sample start</b>	22/01/2020	22/01/2020
<b>Sample end</b>	23/01/2020	23/01/2020
<b>Compound</b>	<b>Concentration <math>\mu\text{g}/\text{m}^3</math></b>	
Freon 11	2.9	3.3
Freon 12	5.5	5.8

All samples collected have reported freon 11 and freon 12 concentrations above the limit of reporting (LOR).

There are currently no Victorian or National ambient air quality objectives for 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.



Anthony Myszka  
*Environmental Technician*



Mark Tulau  
*Senior Air Quality Specialist*

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**APPENDIX A**

**Lab Results**

## Appendix A - Volatile Organic compounds

Location	West	North
Sample No	20-120	20-121
Start date	22/01/2020	22/01/2020
End date	23/01/2020	23/01/2020
Compound	Concentration ( $\mu\text{g}/\text{m}^3$ )	
Acrolein	<3.6	<3.5
Acrylonitrile	<9.3	<9
tert-Amyl Methyl Ether	<3.1	<3
Benzene	<2.6	<2.5
Bromodichloromethane	<5.2	<5
Bromoform	<6.2	<6
Bromomethane	<4.6	<4.5
1,3-Butadiene	<1.5	<1.5
2-Butanone (Methyl Ethyl Ketone)	<2.6	<2.5
tert-Butyl Alcohol	<2.6	<2.5
n-Butylbenzene	<4.1	<4
sec-Butylbenzene	<4.1	<4
tert-Butylbenzene	<4.1	<4
Carbon Tetrachloride	<5.2	<5
Chlorobenzene	<3.1	<3
Chloroethane	<3.1	<3
Chloroform	<4.6	<4.5
Chloromethane	<3.6	<3.5
2-Chloroprene	<5.7	<5.5
3-Chloropropene	<3.6	<3.5
2-Chlorotoluene	<4.6	<4.5
alpha-Chlorotoluene	<3.6	<3.5
Cumene	<4.1	<4
Cyclohexane	<2.1	<2
o-Cymene	<4.1	<4
Dibromochloromethane	<6.2	<6
1,2-Dibromoethane (EDB)	<6.2	<6
1,2-Dichlorobenzene	<6.7	<6.5
1,3-Dichlorobenzene	<6.7	<6.5
1,4-Dichlorobenzene	<6.7	<6.5
1,1-Dichloroethane	<3.6	<3.5
1,2-Dichloroethane	<5.2	<5
1,1-Dichloroethene	<3.1	<3
cis-1,2-Dichloroethene	<4.1	<4
trans-1,2-Dichloroethene	<3.1	<3
1,2-Dichloropropane	<9.3	<9
cis-1,3-Dichloropropene	<3.1	<3
trans-1,3-Dichloropropene	<3.6	<3.5
Diisopropyl Ether	<3.6	<3.5
1,4-Dioxane	<3.1	<3
Ethyl Acetate	<4.1	<4
Ethyl Benzene	<3.1	<3
Ethyl tert-Butyl Ether	<2.6	<2.5
4-Ethyltoluene	<3.1	<3

## Appendix A - Volatile Organic compounds

Location	West	North
Sample No	20-120	20-121
Start date	22/01/2020	22/01/2020
End date	23/01/2020	23/01/2020
Compound	Concentration ( $\mu\text{g}/\text{m}^3$ )	
Freon 11	<b>2.9</b>	<b>3.3</b>
Freon 113	<5.2	<5
Freon 114	<1.5	<1.5
Freon 12	<b>5.5</b>	<b>5.8</b>
Heptane	<3.6	<3.5
Hexachlorobutadiene	<10	<10
Hexane	<3.1	<3
2-Hexanone	<3.1	<3
m,p-Xylene	<6.7	<6.5
Methyl Methacrylate	<3.6	<3.5
Methyl tert-butyl ether	<3.1	<3
4-Methyl-2-pentanone	<3.1	<3
Naphthalene	<11	<11
2-Propanol	<52	<50
Propene	<5.2	<5
Propylbenzene	<3.6	<3.5
Styrene	<3.1	<3
1,1,1,2-Tetrachloroethane	<5.2	<5
1,1,2,2-Tetrachloroethane	<3.6	<3.5
Tetrachloroethene	<5.7	<5.5
Tetrahydrofuran	<2.1	<2
Toluene	<3.1	<3
1,2,4-Trichlorobenzene	<19	<18
1,1,1-Trichloroethane	<4.1	<4
1,1,2-Trichloroethane	<4.1	<4
Trichloroethene	<4.6	<4.5
1,2,4-Trimethylbenzene	<4.1	<4
1,3,5-Trimethylbenzene	<3.1	<3
2,2,4-Trimethylpentane	<4.6	<4.5
Vinyl Acetate	<3.6	<3.5
Vinyl Bromide	<4.1	<4
Vinyl Chloride	<2.1	<2
o-Xylene	<3.1	<3

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 24/01/2020, Report No M201845

**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.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

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This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

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Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

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.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

**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**