

TECHNICAL MEMORANDUM

DATE 15 January 2021

Project No. 1667000-326-TM-Rev0

TO Barro Group Pty Ltd,

CC

FROM Golder Associates Pty Ltd

EMAIL cvanbrink@golder.com.au

BARRO SUNSHINE LANDFILL – VOLATILE ORGANIC COMPOUNDS (VOC) MONITORING RESULTS

Barro Group Pty Ltd (Barro) engaged Golder Associates Pty Ltd. (Golder) to undertake boundary monitoring for volatile organic compounds (VOCs) at two 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 2nd to 12th January 2021.

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 ^o	✓	✓
Unrestricted air flow of 270 ^o around sample inlet or 180 ^o 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 6-litre electro-polished (SUMMA) stainless steel canisters fitted with a flow restricting device set to sample over 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 (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 2nd to 12th January 2021 are presented in Table 2. A complete list of measured VOC concentrations are presented in Appendix A.

Table 2: Results: VOCs by evacuated canister

Site	West	North	West	North	West	North	West	North
Sample No	20-2170	20-2171	20-2184	20-2185	20-2190	20-2191	20-2200	20-2201
Sample start	2/01/2021	2/01/2021	5/01/2021	5/01/2020	8/01/2021	8/01/2021	11/01/2021	11/01/2021
Sample end	3/01/2021	3/01/2021	6/01/2021	6/01/2020	9/01/2021	9/01/2021	12/01/2021	12/01/2021
Compound	Concentration $\mu\text{g}/\text{m}^3$							
Freon 11	3.0	2.7	1.5	1.6	<1.3	1.7	<1.5	1.4
Freon 12	5.9	5.1	2.5	2.4	2.4	2.5	2.4	2.4
Tetrachloroethene	<5.1	<4.4	<4.8	<4.6	<4.9	<4.7	17	<5.3

All samples reported a concentration of freon-12 above the limit of reporting (LOR). All samples report concentrations of freon-11 above the LOR except for sample 20-2190 and 20-2200. Sample 20-2200 reported a concentration of tetrachloroethene above the LOR.

The *State Environment Protection Policy (Air Quality Management)* (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 to 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.

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

Important information relating to this report

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in Appendix B of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

GOLDER ASSOCIATES PTY LTD



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APPENDIX A

Lab Reports

Appendix A - Volatile Organic compounds

Location	West	North	West	North	West	North	West	North
Sample No	20-2170	20-2171	20-2184	20-2185	20-2190	20-2191	20-2200	20-2201
Start date	2/01/2021	2/01/2021	5/01/2021	5/01/2020	8/01/2021	8/01/2021	11/01/2021	11/01/2021
End date	3/01/2021	3/01/2021	6/01/2021	6/01/2020	9/01/2021	9/01/2021	12/01/2021	12/01/2021
Compound	Concentration (µg/m ³)		Concentration (µg/m ³)		Concentration (µg/m ³)		Concentration (µg/m ³)	
Acrolein	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Acrylonitrile	<8.3	<7.2	<7.8	<7.5	<8	<7.7	<9.3	<8.7
tert-Amyl Methyl Ether	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Benzene	<2.3	<2	<2.2	<2.1	<2.2	<2.1	<2.6	<2.4
Bromodichloromethane	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
Bromoform	<5.5	<4.8	<5.2	<5	<5.3	<5.2	<6.2	<5.8
Bromomethane	<4.2	<3.6	<3.9	<3.7	<4	<3.9	<4.6	<4.3
1,3-Butadiene	<1.4	<1.2	<1.3	<1.2	<1.3	<1.3	<1.5	<1.4
2-Butanone	<2.3	<2	<2.2	<2.1	<2.2	<2.1	<2.6	<2.4
tert-Butyl Alcohol	<2.3	<2	<2.2	<2.1	<2.2	<2.1	<2.6	<2.4
n-Butylbenzene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
sec-Butylbenzene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
tert-Butylbenzene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Carbon Tetrachloride	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
Chlorobenzene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Chloroethane	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Chloroform	<4.2	<3.6	<3.9	<3.7	<4	<3.9	<4.6	<4.3
Chloromethane	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
2-Chloroprene	<5.1	<4.4	<4.8	<4.6	<4.9	<4.7	<5.7	<5.3
3-Chloropropene	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
2-Chlorotoluene	<4.2	<3.6	<3.9	<3.7	<4	<3.9	<4.6	<4.3
alpha-Chlorotoluene	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Cumene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Cyclohexane	<1.8	<1.6	<1.7	<1.7	<1.8	<1.7	<2.1	<1.9
o-Cymene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Dibromochloromethane	<5.5	<4.8	<5.2	<5	<5.3	<5.2	<6.2	<5.8
1,2-Dibromoethane (EDB)	<5.5	<4.8	<5.2	<5	<5.3	<5.2	<6.2	<5.8
1,2-Dichlorobenzene	<6	<5.2	<5.6	<5.4	<5.8	<5.6	<6.7	<6.3
1,3-Dichlorobenzene	<6	<5.2	<5.6	<5.4	<5.8	<5.6	<6.7	<6.3
1,4-Dichlorobenzene	<6	<5.2	<5.6	<5.4	<5.8	<5.6	<6.7	<6.3
1,1-Dichloroethane	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
1,2-Dichloroethane	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
1,1-Dichloroethene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
cis-1,2-Dichloroethene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
trans-1,2-Dichloroethene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
1,2-Dichloropropane	<8.3	<7.2	<7.8	<7.5	<8	<7.7	<9.3	<8.7
cis-1,3-Dichloropropene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
trans-1,3-Dichloropropene	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Diisopropyl Ether	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
1,4-Dioxane	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Ethyl Acetate	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Ethyl Benzene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Ethyl tert-Butyl Ether	<2.3	<2	<2.2	<2.1	<2.2	<2.1	<2.6	<2.4
4-Ethyltoluene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9

Appendix A - Volatile Organic compounds

Location	West	North	West	North	West	North	West	North
Sample No	20-2170	20-2171	20-2184	20-2185	20-2190	20-2191	20-2200	20-2201
Start date	2/01/2021	2/01/2021	5/01/2021	5/01/2020	8/01/2021	8/01/2021	11/01/2021	11/01/2021
End date	3/01/2021	3/01/2021	6/01/2021	6/01/2020	9/01/2021	9/01/2021	12/01/2021	12/01/2021
Compound	Concentration ($\mu\text{g}/\text{m}^3$)		Concentration ($\mu\text{g}/\text{m}^3$)		Concentration ($\mu\text{g}/\text{m}^3$)		Concentration ($\mu\text{g}/\text{m}^3$)	
Freon 11	3	2.7	1.5	1.6	<1.3	1.7	<1.5	1.4
Freon 113	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
Freon 114	<1.4	<1.2	<1.3	<1.2	<1.3	<1.3	<1.5	<1.4
Freon 12	5.9	5.1	2.5	2.4	2.4	2.5	2.4	2.4
Heptane	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Hexachlorobutadiene	<9.2	<7.9	<8.7	<8.3	<8.9	<8.6	<10	<9.6
Hexane	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
2-Hexanone	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
m,p-Xylene	<6	<5.2	<5.6	<5.4	<5.8	<5.6	<6.7	<6.3
Methyl Methacrylate	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Methyl tert-butyl ether	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
4-Methyl-2-pentanone	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
Naphthalene	<9.7	<8.3	<9.1	<8.7	<9.3	<9	<11	<10
2-Propanol	<46	<40	<43	<42	<44	<43	<52	<48
Propene	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
Propylbenzene	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Styrene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
1,1,1,2-Tetrachloroethane	<4.6	<4	<4.3	<4.2	<4.4	<4.3	<5.2	<4.8
1,1,1,2-Tetrachloroethane	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Tetrachloroethene	<5.1	<4.4	<4.8	<4.6	<4.9	<4.7	17	<5.3
Tetrahydrofuran	<1.8	<1.6	<1.7	<1.7	<1.8	<1.7	<2.1	<1.9
Toluene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
1,2,4-Trichlorobenzene	<17	<14	<16	<15	<16	<15	<19	<17
1,1,1-Trichloroethane	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
1,1,2-Trichloroethane	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Trichloroethene	<4.2	<3.6	<3.9	<3.7	<4	<3.9	<4.6	<4.3
1,2,4-Trimethylbenzene	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
1,3,5-Trimethylbenzene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<2.9
2,2,4-Trimethylpentane	<4.2	<3.6	<3.9	<3.7	<4	<3.9	<4.6	<4.3
Vinyl Acetate	<3.2	<2.8	<3	<2.9	<3.1	<3	<3.6	<3.4
Vinyl Bromide	<3.7	<3.2	<3.5	<3.3	<3.5	<3.4	<4.1	<3.9
Vinyl Chloride	<1.8	<1.6	<1.7	<1.7	<1.8	<1.7	<2.1	<1.9
o-Xylene	<2.8	<2.4	<2.6	<2.5	<2.7	<2.6	<3.1	<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 06/01/2020 Report No ME318198, 13/01/2021,

Report No ME318254, 09/01/2021 Report No ME318255, 13/01/2021 Report No ME318286

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.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

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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.

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