



CERTIFICATE OF ANALYSIS # DAU09_364

Client	Gunns Limited PO Box 572 Launceston TAS 7250	Job No.	GUNN03/091119
		Sampled by	Client
		Date Sampled	17-Nov-09
Contact	Lawson Harding	Date Received	19-Nov-09

The results relate only to the sample(s) tested.

Method | AUTL_01 | **Date Reported** | 7-Dec-09

Details | The method is for determination of tetra- through octa-chlorinated dibenzo-p-dioxins (PCDDs) & dibenzofurans (PCDFs), plus "dioxin-like" PCBs in aqueous samples by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). This method provides data on all toxic 2,3,7,8-PCDD (seven) and PCDF (ten) isomers as well as the "dioxin-like" PCBs (twelve). PCDD and PCDF totals for each homologue group (tetra to octa) are also reported. The dioxin toxicity equivalent ($WHO_{05}\text{-TEQ}_{DF} / \text{TEQ}_P$) in each sample is calculated using World Health Organization toxic equivalency factors ($WHO_{05}\text{-TEFs}$). All results are corrected for labelled surrogate recoveries.

After sampling, the liquid is spiked with a range of isotopically labelled surrogate standards and exhaustively extracted. Clean up is effected by partitioning with sulphuric acid then distilled water. Further purification is performed using column chromatography on acid and base modified silica gels, basic alumina and carbon dispersed on celite.

Immediately prior to injection, internal standards are added to each extract, and an aliquot of the extract is injected into the GC. The analytes are separated by the GC and detected by a high-resolution (>10,000) mass spectrometer.

Authorisation

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Dioxin Analysis Unit

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Chemist
Dioxin Analysis Unit

Accreditation



NATA Accredited Laboratory Number : 198
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Sample Details : Job No. GUNN03/091119			
Laboratory Reg. No.	Client Sample Ref.	Matrix	Description
NQ09/05766X	H1 (A&B)	Aqueous	Water

Project Details

Project Name	Overseas Effluent
Project Number	Not specified

Key

Analytes

TCDD	Tetrachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
PeCDD	Pentachlorodibenzo-p-dioxin	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	HxCDF	Hexachlorodibenzofuran
HpCDD	Heptachlorodibenzo-p-dioxin	HpCDF	Heptachlorodibenzofuran
OCDD	Octachlorodibenzo-p-dioxin	OCDF	Octachlorodibenzofuran
PCB 77	3,3',4,4'-Tetrachlorobiphenyl	PCB 126	3,3',4,4',5-Pentachlorobiphenyl
PCB 81	3,4,4',5-Tetrachlorobiphenyl	PCB 156	2,3,3',4,4',5-Hexachlorobiphenyl
PCB 105	2,3,3',4,4'-Pentachlorobiphenyl	PCB 157	2,3,3',4,4',5'-Hexachlorobiphenyl
PCB 114	2,3,4,4',5-Pentachlorobiphenyl	PCB 167	2,3',4,4',5,5'-Hexachlorobiphenyl
PCB 118	2,3',4,4',5-Pentachlorobiphenyl	PCB 169	3,3',4,4',5,5'-Hexachlorobiphenyl
PCB 123	2',3,4,4',5-Pentachlorobiphenyl	PCB 189	2,3,3',4,4',5,5'-Heptachlorobiphenyl

Units & Abbreviations

pg/kg	picograms per kilogram
<	level less than limit of detection (LOD)
WHO ₀₅ -TEF [†]	World Health Organization toxic equivalency factor
WHO ₀₅ -TEQ _{DF} [†]	World Health Organization toxic equivalents (Dioxins & Furans)
WHO ₀₅ -TEQ _P [†]	World Health Organization toxic equivalents (PCBs)

[†] as defined by Van den Berg et al., *Toxicol. Sci.* **93** (2), pp. 223–241 (2006)

TEQs are calculated by multiplying the quantified level for each individual dioxin, furan and PCB congener reported by the corresponding TEF value and summing the result:


$$\text{WHO}_{05}\text{-TEQ}_{\text{DF}} = \sum_{i=1}^7 [\text{PCDD}_i \times \text{TEF}_i] + \sum_{j=1}^{10} [\text{PCDF}_j \times \text{TEF}_j]$$

i = PCDD congener index (1 - 7)
j = PCDF congener index (1 - 10)

$$\text{WHO}_{05}\text{-TEQ}_{\text{P}} = \sum_{k=1}^{12} [\text{PCB}_k \times \text{TEF}_k]$$

k = PCB congener index (1 - 12)

Lower Bound TEQ	defines all congener values reported below the LOD as equal to zero.
Middle Bound TEQ	defines all congener values reported below the LOD as equal to half the LOD.
Upper Bound TEQ	defines all congener values reported below the LOD as equal to the LOD.

Surrogate Recovery	percentage recovery for ¹³ C ₁₂ labelled surrogate standard
	Laboratory surrogate recovery outside normal acceptance criteria: Solid and liquid matrices : 25 - 125% [PCDD/Fs // PCBs]

Results : Job No. GUNN03/091119

Laboratory Reg. No. NQ09/05766X
Client Sample Ref. H1 (A&B)
Matrix Aqueous
Description Water

Date Extracted 2-Dec-09
DB5 Analysis 7-Dec-09
PCB Analysis 4-Dec-09

PCDD/F Congeners	Level pg/kg	WHO ₀₅ -TEF	WHO ₀₅ -TEQ _{DF} contribution	Labelled Surrogate recovery
2,3,7,8-TCDF	<0.5	0.1	0.025	86
2,3,7,8-TCDD	<0.9	1	0.45	85
1,2,3,7,8-PeCDF	<0.6	0.03	0.009	85
2,3,4,7,8-PeCDF	<0.4	0.3	0.06	83
1,2,3,7,8-PeCDD	<0.6	1	0.3	89
1,2,3,4,7,8-HxCDF	<0.4	0.1	0.02	80
1,2,3,6,7,8-HxCDF	<0.5	0.1	0.025	77
2,3,4,6,7,8-HxCDF	<0.5	0.1	0.025	82
1,2,3,7,8,9-HxCDF	<0.6	0.1	0.03	83
1,2,3,4,7,8-HxCDD	<0.6	0.1	0.03	90
1,2,3,6,7,8-HxCDD	<0.7	0.1	0.035	81
1,2,3,7,8,9-HxCDD	<0.6	0.1	0.03	
1,2,3,4,6,7,8-HpCDF	<1	0.01	0.005	82
1,2,3,4,7,8,9-HpCDF	<1	0.01	0.005	69
1,2,3,4,6,7,8-HpCDD	<2	0.01	0.01	80
OCDF	<1	0.0003	0.00015	
OCDD	<3	0.0003	0.00045	61

PCB Congeners	Level pg/kg	WHO ₀₅ -TEF	WHO ₀₅ -TEQ _P contribution	Labelled Surrogate recovery
Non-Ortho PCBs				
PCB 77	<2	0.0001	0.0001	81
PCB 81	<0.5	0.0003	0.000075	78
PCB 126	<1	0.1	0.05	82
PCB 169	<1	0.03	0.015	89
Mono-Ortho PCBs				
PCB 105	<30	0.00003	0.00045	64
PCB 114	<2	0.00003	0.00003	72
PCB 118	<100	0.00003	0.0015	71
PCB 123	<4	0.00003	0.00006	77
PCB 156	<20	0.00003	0.0003	69
PCB 157	<3	0.00003	0.000045	60
PCB 167	<8	0.00003	0.00012	86
PCB 189	<7	0.00003	0.00011	81

PCDD/F Homologue Groups	Level pg/kg
Total TCDF isomers	<4
Total TCDD isomers	50
Total PeCDF isomers	<4
Total PeCDD isomers	<4
Total HxCDF isomers	<3
Total HxCDD isomers	<2
Total HpCDF isomers	<2
Total HpCDD isomers	<2

Summary Results			
Sum of PCDD and PCDF congeners			
Excluding LOD values		50	pg/kg
WHO₀₅-TEQ_{DF}			
Lower Bound [excluding LOD values]		0	pg/kg
Middle Bound [including half LOD values]		1.1	pg/kg
Upper Bound [including LOD values]		2.1	pg/kg
WHO₀₅-TEQ_P			
Lower Bound [excluding LOD values]		0	pg/kg
Middle Bound [including half LOD values]		0.068	pg/kg
Upper Bound [including LOD values]		0.14	pg/kg