



Environmental Forensics Report of Analysis
Project 20230224

Report #: 1771
Date Issued: 31-Jul-2023
Page 1 of 12

Client Project Reference: Menindee Fish Kill - 41 (IMT 22 Jun

Customer: Department of Planning & Environment

Attention: [REDACTED]

Report Date: 31 July 2023

Project Received: 23 June 2023

EF Project Contact: [REDACTED]
[REDACTED]
[REDACTED]



The following samples were analysed:

Sample ID	Client ID	Sample Type	Client Sampled Date/Time	Aliquot	Client Description
235469	E12	Liquid	22/06/2023 8:59AM		
235480	E12	Liquid	22/06/2023 8:59AM	Field Aliquot	
235491	E12	Liquid	22/06/2023 8:59AM	Field Aliquot	
235502	E12	Liquid	22/06/2023 8:59AM	Field Aliquot	
235513	E12	Liquid	22/06/2023 8:59AM	Field Aliquot	
235524	E12	Liquid	22/06/2023 8:59AM	Field Aliquot	
235470	E15	Liquid	22/06/2023 10:35AM		
235481	E15	Liquid	22/06/2023 10:35AM	Field Aliquot	
235492	E15	Liquid	22/06/2023 10:35AM	Field Aliquot	
235503	E15	Liquid	22/06/2023 10:35AM	Field Aliquot	
235514	E15	Liquid	22/06/2023 10:35AM	Field Aliquot	
235525	E15	Liquid	22/06/2023 10:35AM	Field Aliquot	
235471	E14	Liquid	22/06/2023 11:55AM		
235482	E14	Liquid	22/06/2023 11:55AM	Field Aliquot	
235493	E14	Liquid	22/06/2023 11:55AM	Field Aliquot	
235504	E14	Liquid	22/06/2023 11:55AM	Field Aliquot	
235515	E14	Liquid	22/06/2023 11:55AM	Field Aliquot	
235526	E14	Liquid	22/06/2023 11:55AM	Field Aliquot	
235936	MFK-Z-E11-F1	Liquid	22/06/2023		Trip 12
235937	MFK-Z-E12-F1	Liquid	22/06/2023		Trip 12
235938	MFK-Z-E14-F1	Liquid	22/06/2023		Trip 12
235939	MFK-Z-E11-F2	Liquid	22/06/2023		Trip 12
235940	MFK-Z-E12-F2	Liquid	22/06/2023		Trip 12
235941	MFK-Z-E14-F2	Liquid	22/06/2023		Trip 12
235942	MFK-Z-E11-UNF	Liquid	22/06/2023		
235943	MFK-Z-E12-UNF	Liquid	22/06/2023		
235944	MFK-Z-E14-UNF	Liquid	22/06/2023		
236021	Annabranh-F1	Liquid	22/06/2023		Trip 12
236022	Annabranh-F2	Liquid	22/06/2023		Trip 12

Tests not covered by NATA accreditation 3040 are denoted with *

Codes: SN = Sample Note

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236023	Murray-F1	Liquid	22/06/2023	Trip 12
236024	Murray-F2	Liquid	22/06/2023	Trip 12
236025	Murray-UNF	Liquid	22/06/2023	Trip 12
236026	Wentworth-F1	Liquid	22/06/2023	Trip 12
236027	Wentworth-F2	Liquid	22/06/2023	Trip 12
236029	MFK-Z-E15-F1	Liquid	22/06/2023	Trip 12
236030	MFK-Z-E15-F2	Liquid	22/06/2023	Trip 12
236031	MFK-Z-E15-UNF	Liquid	22/06/2023	Trip 12

Report Notes

- This document has been authorised by the person whose name appears in this report.
- This report shall not be reproduced except in full. Samples analysed as received from the client.
- Results reported as 'less than' (<) indicates a result below the practical quantitation limit for the sample matrix and method used.

Project Comments

· Samples 235524, 235525 and 235526 were sent to Sydney Water Laboratory Services (NATA Accreditation no: 63 and 610) for the analysis of Full Blue-Green Algal ID and Enumeration. Please see detailed results in the attached Phytoplankton Analysis Report no. 287713 dated 12 July 2023.
 Samples 235502, 235503 and 235504 were sent to Sydney Water Laboratory Services (NATA Accreditation no: 63 and 610) for the analysis of Algal Toxins. Please see the attached Analytical Report No: 287713 dated 12 July 2023, which gives Algal Toxins analysis results and the Full Blue-Green Algal ID and Enumeration summary results.

· Samples 235937 to 235944, 236021 to 236027 and 236029 to 236031 were sent to ALS Environmental Laboratory (NATA Accreditation no: 825) for the analysis of EK255A: Ammonia, EK259A: Nitrite and Nitrate (NOx), EK262A: Total Nitrogen, EK267A: Total Phosphorus (Persulfate Digestion), EK271A: Reactive Phosphorus. This report summarises data from the attached external report: ES2321881, dated 07-Jul-2023.

· Sample 235936 was also sent to ALS Environmental Laboratory (NATA Accreditation no: 825) for the analysis of EK255A: Ammonia, EK259A: Nitrite and Nitrate (NOx), EK271A: Reactive Phosphorus. This report summarises data from the attached external report: ES2323857, dated 19-Jul-2023.

· Sample 235480, 235481 and 235482 were sent to ALS Environmental Laboratory (NATA Accreditation no: 825) for the analysis of EP202A: Phenoxyacetic Acid Herbicides by LCMS, EP204: Glyphosate and AMPA. This report summarises data from the attached external report: ES2321455, dated 3-Jul-2023.

· Samples 235469, 235470 and 235471 were analysed outside the method holding time for Total suspended solids.

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Analysis Results - External Methods*

Area - EXTERNAL

	Sample ID	Start Date	Client ID	235502	235524	235503	235525	235504	235526
				26/06/2023	10/07/2023	26/06/2023	10/07/2023	26/06/2023	10/07/2023
Analyte				E12	E12	E15	E15	E14	E14
Algal Enumeration	-				RC		RC		RC
Algal Identification	-				RC		RC		RC
Algal Toxins	-			RC		RC		RC	

Analysis Results - External Methods*

Area - EXTERNAL

	Sample ID	Start Date	Client ID	235480	235481	235482
				28/06/2023	28/06/2023	28/06/2023
Analyte				E12	E15	E14
2.4.5-T	µg/L	<10	<10	<10		
2.4.6-T	µg/L	<10	<10	<10		
2.4-D	µg/L	<10	<10	<10		
2.4-DB	µg/L	<10	<10	<10		
2.4-DP	µg/L	<10	<10	<10		
2.6-D	µg/L	<10	<10	<10		
4-Chlorophenoxy acetic acid	µg/L	<10	<10	<10		
AMPA	µg/L	<10	<10	<10		
Clopyralid	µg/L	<10	<10	<10		
Dicamba	µg/L	<10	<10	<10		
Fluroxypyr	µg/L	<10	<10	<10		
Glyphosate	µg/L	<10	<10	<10		
MCPA	µg/L	<10	<10	<10		
MCPB	µg/L	<10	<10	<10		
Mecoprop	µg/L	<10	<10	<10		
Picloram	µg/L	<10	<10	<10		
Silvex (2.4.5-TP/Fenoprop)	µg/L	<10	<10	<10		
Triclopyr	µg/L	<10	<10	<10		

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Analysis Results - External Methods*

Area - EXTERNAL

Analyte

	<i>Sample ID</i>	<i>Start Date</i>	<i>Client ID</i>	235936	235937	235938	235939	235940	235941	235942	235943	235944	236021	236022	236023
				18/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023
				MFK-Z-E11-F1	MFK-Z-E12-F1	MFK-Z-E14-F1	MFK-Z-E11-F2	MFK-Z-E12-F2	MFK-Z-E14-F2	MFK-Z-E11-UNF	MFK-Z-E12-UNF	MFK-Z-E14-UNF	Annabranth-F1	Annabranth-F2	Murray-F1
Ammonia as N	mg/L			0.007	0.019	0.013							0.007		<0.010
Dissolved Total Nitrogen as N	mg/L						1.06	1.13	1.11					0.96	
Dissolved Total Phosphorus as P	mg/L						0.096	0.111	0.146					0.015	
Nitrite+Nitrate as N	mg/L			0.048	0.096	0.238							0.016		0.012
Reactive Phosphorus as P	mg/L			0.045	0.088	0.078							<0.001		<0.001
Total Nitrogen as N	mg/L									0.82	1.42	1.40			
Total Phosphorus as P	mg/L									0.086	0.149	0.175			

Analysis Results - External Methods*

Area - EXTERNAL

Analyte

	<i>Sample ID</i>	<i>Start Date</i>	<i>Client ID</i>	236024	236025	236026	236027	236029	236030	236031
				3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023	3/07/2023
				Murray-F2	Murray-UNF	Wentworth-F1	Wentworth-F2	MFK-Z-E15-F1	MFK-Z-E15-F2	MFK-Z-E15-UNF
Ammonia as N	mg/L					0.140		0.032		
Dissolved Total Nitrogen as N	mg/L			0.25			1.33		1.28	
Dissolved Total Phosphorus as P	mg/L			<0.005			0.126		0.142	
Nitrite+Nitrate as N	mg/L					0.336		0.322		
Reactive Phosphorus as P	mg/L					0.091		0.118		
Total Nitrogen as N	mg/L				0.32					1.15
Total Phosphorus as P	mg/L				0.034					0.150

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Analysis Results - ICVAASW

Area - INORGANIC

<i>Sample ID</i>	235513	235514	235515
<i>Start Date</i>	18/07/2023	18/07/2023	18/07/2023
<i>Client ID</i>	E12	E15	E14

Analyte

<i>Analyte</i>	<i>Unit</i>	235513	235514	235515
Mercury	µg/L	<0.05	<0.05	<0.05

Analysis Results - ICPAES

Area - INORGANIC

<i>Sample ID</i>	235513	235514	235515
<i>Start Date</i>	26/06/2023	26/06/2023	26/06/2023
<i>Client ID</i>	E12	E15	E14

Analyte

<i>Analyte</i>	<i>Unit</i>	235513	235514	235515
Aluminium (Lab. filtered)	mg/L	<0.04	<0.04	<0.04
Barium (Lab. filtered)	mg/L	0.10	0.11	0.10
Boron (Lab. filtered)	mg/L	<0.1	<0.1	<0.1
Calcium (Lab. filtered)	mg/L	34	36	36
Iron (Lab. filtered)	mg/L	<0.1	<0.1	<0.1
Magnesium (Lab. filtered)	mg/L	16	16	16
Potassium (Lab. filtered)	mg/L	13	12	12
Sodium (Lab. filtered)	mg/L	49	47	48
Strontium (Lab. filtered)	mg/L	0.37	0.38	0.38
Sulfur (Lab. filtered)	mg/L	2.9	2.8	2.9
Titanium (Lab. filtered)	mg/L	<0.01	<0.01	<0.01

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Analysis Results - ICPMS

Area - INORGANIC

	<i>Sample ID</i>	235513	235514	235515
	<i>Start Date</i>	26/06/2023	26/06/2023	26/06/2023
	<i>Client ID</i>	E12	E15	E14
<i>Analyte</i>				
Antimony (Lab. filtered)	mg/L	<0.0005	<0.0005	<0.0005
Arsenic (Lab. filtered)	mg/L	0.005	0.005	0.004
Beryllium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001
Cadmium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001
Chromium (Lab. filtered)	mg/L	<0.001	<0.001	<0.001
Cobalt (Lab. filtered)	mg/L	0.0004	0.0003	0.0003
Copper (Lab. filtered)	mg/L	0.0021	0.0019	0.0019
Lead (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001
Lithium (Lab. filtered)	mg/L	0.0018	0.0018	0.0017
Manganese (Lab. filtered)	mg/L	<0.001	<0.001	<0.001
Molybdenum (Lab. filtered)	mg/L	0.0011	0.0008	0.0012
Nickel (Lab. filtered)	mg/L	0.0035	0.0037	0.0035
Selenium (Lab. filtered)	mg/L	<0.005	<0.005	<0.005
Silver (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001
Thallium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001
Tin (Lab. filtered)	mg/L	<0.0002	<0.0002	<0.0002
Vanadium (Lab. filtered)	mg/L	0.010	0.011	0.011
Zinc (Lab. filtered)	mg/L	<0.001	0.001	0.001

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Analysis Results - ICPAES

Area - INORGANIC

<i>Sample ID</i>	<i>Start Date</i>	<i>Client ID</i>
235513	26/06/2023	E12
235514	26/06/2023	E15
235515	26/06/2023	E14

Analyte

Analyte	Unit	235513	235514	235515
Aluminium (acid extractable)	mg/L	3.9	7.3	6.7
Barium (acid extractable)	mg/L	0.13	0.14	0.14
Boron (acid extractable)	mg/L	<0.1	<0.1	<0.1
Calcium (acid extractable)	mg/L	37	40	38
Iron (acid extractable)	mg/L	3.2	5.7	5.3
Magnesium (acid extractable)	mg/L	17	19	18
Manganese (acid extractable)	mg/L	0.12	0.12	0.12
Potassium (acid extractable)	mg/L	14	15	14
Sodium (acid extractable)	mg/L	52	50	50
Strontium (acid extractable)	mg/L	0.40	0.42	0.41
Sulfur (acid extractable)	mg/L	3.0	3.0	3.0
Titanium (acid extractable)	mg/L	0.02	0.04	0.04

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Analysis Results - ICPMS

Area - INORGANIC

<i>Sample ID</i>	<i>Start Date</i>	<i>Client ID</i>
235513	26/06/2023	E12
235514	26/06/2023	E15
235515	26/06/2023	E14

<i>Analyte</i>				
Antimony (acid extractable)	mg/L	<0.0005	<0.0005	<0.0005
Arsenic (acid extractable)	mg/L	0.005	0.005	0.005
Beryllium (acid extractable)	mg/L	0.0001	0.0002	0.0002
Cadmium (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001
Chromium (acid extractable)	mg/L	0.004	0.006	0.006
Cobalt (acid extractable)	mg/L	0.0019	0.0025	0.0024
Copper (acid extractable)	mg/L	0.0043	0.0056	0.0053
Lead (acid extractable)	mg/L	0.0010	0.0016	0.0015
Lithium (acid extractable)	mg/L	0.0029	0.0037	0.0036
Molybdenum (acid extractable)	mg/L	0.0015	0.0013	0.0014
Nickel (acid extractable)	mg/L	0.0064	0.0079	0.0075
Selenium (acid extractable)	mg/L	<0.005	<0.005	<0.005
Silver (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001
Thallium (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001
Tin (acid extractable)	mg/L	<0.0002	<0.0002	<0.0002
Vanadium (acid extractable)	mg/L	0.017	0.022	0.021
Zinc (acid extractable)	mg/L	0.007	0.011	0.010

Analysis Results - IGRSS

Area - INORGANIC

<i>Sample ID</i>	<i>Start Date</i>	<i>Client ID</i>
235469	25/07/2023	E12
235470	25/07/2023	E15
235471	25/07/2023	E14

<i>Analyte</i>				
Fixed Suspended Solids	mg/L	41	90	86
Total Suspended Solids	mg/L	52	110	100
Volatile Suspended Solids	mg/L	11	17	16

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Analysis Results - QQPEST

Area - ORGANIC

Sample ID
Start Date
Client ID

235491 27/06/2023 E12	235492 27/06/2023 E15	235493 27/06/2023 E14
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Analyte		235491 27/06/2023 E12	235492 27/06/2023 E15	235493 27/06/2023 E14
Aldrin	µg/L	<0.3	<0.3	<0.3
Allethrin	µg/L	<0.5	<0.5	<0.5
Alpha-Chlordane	µg/L	<0.4	<0.4	<0.4
alpha-HCH	µg/L	<0.4	<0.4	<0.4
Ametryn	µg/L	<0.5	<0.5	<0.5
Atraton	µg/L	<0.5	<0.5	<0.5
Atrazine	µg/L	<0.5	<0.5	<0.5
beta-HCH	µg/L	<0.5	<0.5	<0.5
Bifenthrin	µg/L	<0.5	<0.5	<0.5
Bioresmethrin	µg/L	<0.3	<0.3	<0.3
Carbophenothion	µg/L	<0.5	<0.5	<0.5
Chlorpyrifos	µg/L	<0.4	<0.4	<0.4
Cis-permethrin	µg/L	<0.3	<0.3	<0.3
Crotoxyphos	µg/L	<0.5	<0.5	<0.5
Cyfluthrin	µg/L	<0.5	<0.5	<0.5
Cypermethrin	µg/L	<0.5	<0.5	<0.5
delta-HCH	µg/L	<0.5	<0.5	<0.5
Deltamethrin	µg/L	<0.5	<0.5	<0.5
Diazinon	µg/L	<0.5	<0.5	<0.5
Dichlorvos	µg/L	<0.4	<0.4	<0.4
Dieldrin	µg/L	<0.5	<0.5	<0.5
Dimethoate	µg/L	<0.5	<0.5	<0.5
Endosulfan II	µg/L	<1.0	<1.0	<1.0
Endosulfan I	µg/L	<0.9	<0.9	<0.9
Endosulfan Sulfate	µg/L	<1.0	<1.0	<1.0
Endrin Aldehyde	µg/L	<0.5	<0.5	<0.5
Endrin Ketone	µg/L	<0.5	<0.5	<0.5
Endrin	µg/L	<0.5	<0.5	<0.5
Ethion	µg/L	<0.5	<0.5	<0.5
Fenamiphos	µg/L	<0.5	<0.5	<0.5
Fenitrothion	µg/L	<0.5	<0.5	<0.5
Fenthion	µg/L	<0.4	<0.4	<0.4

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Analysis Results - QQPEST

Area - ORGANIC

Sample ID	235491	235492	235493
Start Date	27/06/2023	27/06/2023	27/06/2023
Client ID	E12	E15	E14

Analyte				
Fenvalerate	µg/L	<0.5	<0.5	<0.5
Gamma-Chlordane	µg/L	<0.4	<0.4	<0.4
gamma-HCH	µg/L	<0.4	<0.4	<0.4
Heptachlor Epoxide	µg/L	<0.5	<0.5	<0.5
Heptachlor	µg/L	<0.4	<0.4	<0.4
Hexachlorobenzene	µg/L	<0.3	<0.3	<0.3
Hexazinone	µg/L	<0.5	<0.5	<0.5
L-cyhalothrin	µg/L	<0.5	<0.5	<0.5
Malathion	µg/L	<0.5	<0.5	<0.5
Methidathion	µg/L	<0.5	<0.5	<0.5
Methyl Azinphos	µg/L	<0.4	<0.4	<0.4
Methyl Chlorpyrifos	µg/L	<0.4	<0.4	<0.4
Methyl Parathion	µg/L	<0.5	<0.5	<0.5
Mevinphos	µg/L	<0.4	<0.4	<0.4
Oxyfluorfen	µg/L	<0.5	<0.5	<0.5
Parathion	µg/L	<0.5	<0.5	<0.5
Phorate	µg/L	<0.4	<0.4	<0.4
Profenofos	µg/L	<0.5	<0.5	<0.5
Prometon	µg/L	<0.5	<0.5	<0.5
Prometryn	µg/L	<0.5	<0.5	<0.5
Propargite	µg/L	<0.5	<0.5	<0.5
Propazine	µg/L	<0.5	<0.5	<0.5
Propetamphos	µg/L	<0.5	<0.5	<0.5
Simazine	µg/L	<0.5	<0.5	<0.5
Simetryn	µg/L	<0.5	<0.5	<0.5
Sulprofos	µg/L	<0.4	<0.4	<0.4
Tebuconazole	µg/L	<0.5	<0.5	<0.5
Tebuthiuron	µg/L	<0.5	<0.5	<0.5
Terbutylazine	µg/L	<0.5	<0.5	<0.5
Terbutryn	µg/L	<0.5	<0.5	<0.5
Tetrachlorvinphos	µg/L	<0.5	<0.5	<0.5
Trans-permethrin	µg/L	<0.7	<0.7	<0.7

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Area - ORGANIC

Sample ID	Client ID	Method	Start Date	Result
235491	E12	OLCSCAN* - LC/MS Scan	26/06/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
235492	E15	OLCSCAN* - LC/MS Scan	26/06/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
235493	E14	OLCSCAN* - LC/MS Scan	26/06/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).

The sample(s) referred to in this report were analysed by the following method(s):

Method code	Method description	Area
External Methods*	External Methods - Analysis completed externally	EXTERNAL
External Methods*	External Methods - Analysis completed externally	EXTERNAL
External Methods*	External Methods - Analysis completed externally	EXTERNAL
ICVAASW	Mercury by Cold Vapour Atomic Absorption Spectroscopy	INORGANIC
ICPAES	Dissolved element analysis by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES)	INORGANIC
ICPMS	Dissolved Metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	INORGANIC
ICPAES	Acid extractable element analysis by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES)	INORGANIC
ICPMS	Acid extractable Metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	INORGANIC
IGRTSS	Total Suspended Solids (TSS) (includes Volatile and Fixed Suspended Solids)	INORGANIC
QQQPEST	Determination of Multiresidue Pesticides by GCMSMS	ORGANIC
OLCSCAN*	Qualitative LC/MS scan	ORGANIC

The results in this report were authorised by:

Name	Title	Area
[REDACTED]	Senior Scientist	EXTERNAL
[REDACTED]	Scientist	INORGANIC
[REDACTED]	Scientist	ORGANIC

Tests not covered by NATA accreditation 3040 are denoted with *

Codes: SN = Sample Note

RN = Result Note

RC = Project Comment