Appendix 5

Groundwater Assessments

(Total No. of pages including blank pages = 72)

(Note: A copy of this Appendix is only available on the Project CD)

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IMPAX group
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Dubbo NSW 2830

Ph: (02) 6885 5536
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6 July 2010

Mr. Josh Loxley
Bogan Shire Council
PO Box 221
Nyngan NSW 2825

RE: BOGAN SHIRE COUNCIL WASTE MANAGEMENT FACILITY GROUNDWATER MONITORING WELLS

The Impax Group were engaged by Bogan Shire to install a total of eight (8) groundwater monitoring wells at the Bogan Shire Council Waste Management Facility, located at Nyngan, NSW.

The wells were drilled and installed on 16-19 June, 2010. Some minor headworks and general site tidying up was finalised on 29 June, 2010.

Wells were constructed using Class 18 screw-fit PCV casing, and completed with 3m of Class 18 screw-fit PVC screen at the bottom of each well. The screen was gravel-packed with washed 2mm graded sand, with the gravel pack extending approximately 1.5m above the top of the screen. A 1m thick bentonite seal was placed above the gravel pack, with the remainder of the hole backfilled with drill cuttings. The wells were completed with a stick-up lockable steel bore protector, which has been cemented into the ground. It is recommended that the wells be secured using a padlock which can be fitted onto the bore protector.

The eight boreholes were individually logged, with details regarding geology/lithology recorded for each well location. The groundwater well logs for each of the eight wells are attached, and also include details regarding well construction, screen location, recorded standing water levels, and a well construction sketch.

If you have any questions regarding the attached groundwater well logs, please contact either Brendan Allan or myself (02) 6885 5536.

Regards

Terry O'Shaughnessy
Managing Director
The Impax Group

Groundwater Drilling Summary

Client: Bogan Shire Council

Location: Nyngan, NSW

Project: Instalation of Groundwater monitoring wells, Nyngan Waste Management Facility

Date: 16th to 20th June 2010

Site Number	Drilled Depth	Completed Depth	Screen Location	SWL
1	20.5	20.5	17.5 - 20.5	16.93
2	20.0	19.0	16.0 - 19.0	17.27
3	20.0	19.3	16.3 - 19.3	17.9
4	24.0	23.0	20.0 - 23.0	16.53
5	20.5	20.5	17.5 - 20.5	16.57
6	20.5	20.5	17.5 - 20.5	16.69
7	20.5	20.0	17.0 - 20.0	18.49
8	20.5	20.0	17.0 - 20.0	17.14

Borehole ID: MW1

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

IMPAX group
ph: 1300 451 121
fax: (02) 6885 3382
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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
0		**Clay** Brown, medium-soft, very slightly moist					
1			1.5				
2		Brown / grey, dry					Annulus backfilled with drill cuttings (0.5-15.0m)
3							
4		Light brown, dry	4.0				
5							
6							Blank 50mm Class 18 PVC casing (0.0-17.5m)
7							
8							
9		Light brown, slightly moist	9.0				
10		Grey / white, soft, slightly moist	10.0				
11			11.5				
12		**Sand** Yellow / white, soft, fine, dry					
13			13.5				
14		**Sandy Clay** Yellow / white, dry	15.0				
15		**Sand with Clay** Orange / yellow, wet					Bentonite Seal (15.0-16.0m)
16							Standing water level 16.93m
17							Annulus backfilled with 2mm graded sand (16.0-20.5m)
18							
19			19.5				Mechanically Slotted 50mm Class 18 PVC Screen (17.5-20.5m)
20		**Sand and Gravels** Brown / orange, poorly sorted	20.5				
21		**Hole Ended at 20.5 in Sand and Gravels**					

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 16 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW1

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

IMPAX group
ph: 1300 451 121
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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
0		**Clay** Brown, medium-soft, very slightly moist					
1			1.5				
2		Brown / grey, dry					Annulus backfilled with drill cuttings (0.5-13.5m)
3							
4			4.5				
5		Light brown, dry					
6							Blank 50mm Class 18 PVC casing (0.0-16.0m)
7							
8			8.5				
9		Light brown, slightly moist					
10			10.0				
11		**Sand** White, fine, dry					
12							
13							
14			14.0				Bentonite Seal (13.5-14.5m)
15		**Clay with Sand** Orange, slightly moist, with lenses of sand					
16							Annulus backfilled with 2mm graded sand (14.5-19.0m)
17							Standing water level 17.27m
18							Mechanically Slotted 50mm Class 18 PVC Screen (16.0-19.0m)
19							
20			20.0				Hole collapsed back to 19.0m
21		**Hole Ended at 20.0 in Clay with Sand**					

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 16 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW3

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
0		**Clay** Dark brown, medium-hard, dry	1.0				
1		Light brown, medium-hard, dry					Annulus backfilled with drill cuttings (0.5-14.0m)
2							
3			3.0				
		Light brown / grey, medium hard, dry					
4							
			5.0				
5		Yellow / orange, sofr, dry					
6							Blank 50mm Class 18 PVC casing (0.0-16.3m)
7							
8							
			9.0				
9		**Sand** Yellow / white, fine, dry					
10							
			11.0				
11		**Sand with Gravels** Yellow / white, small gravels, slightly moist					
12							
13							
14							Bentonite Seal (14.0-15.0m)
			15.0				
15		**Clay with Sand** Yellow / grey, slightly moist					Annulus backfilled with 2mm graded sand (15.0-19.0m)
16							
17							Standing water level 17.90m
			18.0				
18		Orange, damp to wet					Mechanically Slotted 50mm Class 18 PVC Screen (16.3-19.3m)
19							
			20.0				Hole collapsed back to 19.3m
20		**Hole Ended at 20.0 in Clay with Sand**					
21							

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 17 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW4

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
		Clay Brown, medium-soft, dry	2.0				
		Light brown / orange, dry	6.5				Annulus backfilled with drill cuttings (0.5-17.5m)
		Sand Yellow / orange, slightly moist	8.5				Blank 50mm Class 18 PVC casing (0.0-20.0m)
		Sand with Clay Yellow / orange, small amounts of clay, moist	11.0				
		Sand White, dry, fine	12.5				
		Clay with Sand Light brown, moist / damp	16.5				Standing water level 16.53m
		Clay with Sand and Gravels Light brown, moist / damp, gravel lenses	20.5				Bentonite Seal (17.5-18.5m)
		Gravels with Sand Light brown, orange / yellow, poorly sorted gravel, sand lenses	24.0				Annulus backfilled with 2mm graded sand (18.5-23.0m)
		Hole ended at 23.0m in Gravels with Sand					Mechanically Slotted 50mm Class 18 PVC Screen (20.0-23.0m)
							Hole collapsed back to 23.0m

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 17 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

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Borehole ID: MW5

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
0		**Clay** Brown, medium-soft, dry					
1							
2			2.0				Annulus backfilled with drill cuttings (0.5-15.0m)
		light brown, medium, dry					
3							
4							
5							
			6.0				
6		Orange / yellow, medium, dry					Blank 50mm Class 18 PVC casing (0.0-17.5m)
7							
8							
9							
			10.0				
10		**Sand** White, fine, dry					
11							
			12.0				
12		**Sand with Clay** Orange / yellow / light brown, fine, slightly moist, some clay					
13							
14							
			15.0				
15		**Clay with Sand** Light brown / orange, slightly moist, some sand					Bentonite Seal (15.0-16.0m)
16							Standing water level 16.57m
17							Annulus backfilled with 2mm graded sand (16.0-20.5m)
18			18.5				
19		**Sand and Gravels** Brown / orange, poorly sorted					Mechanically Slotted 50mm Class 18 PVC Screen (17.5-20.5m)
20			20.5				
21		**Hole Ended at 20.5 in Sand and Gravels**					

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 17 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW6

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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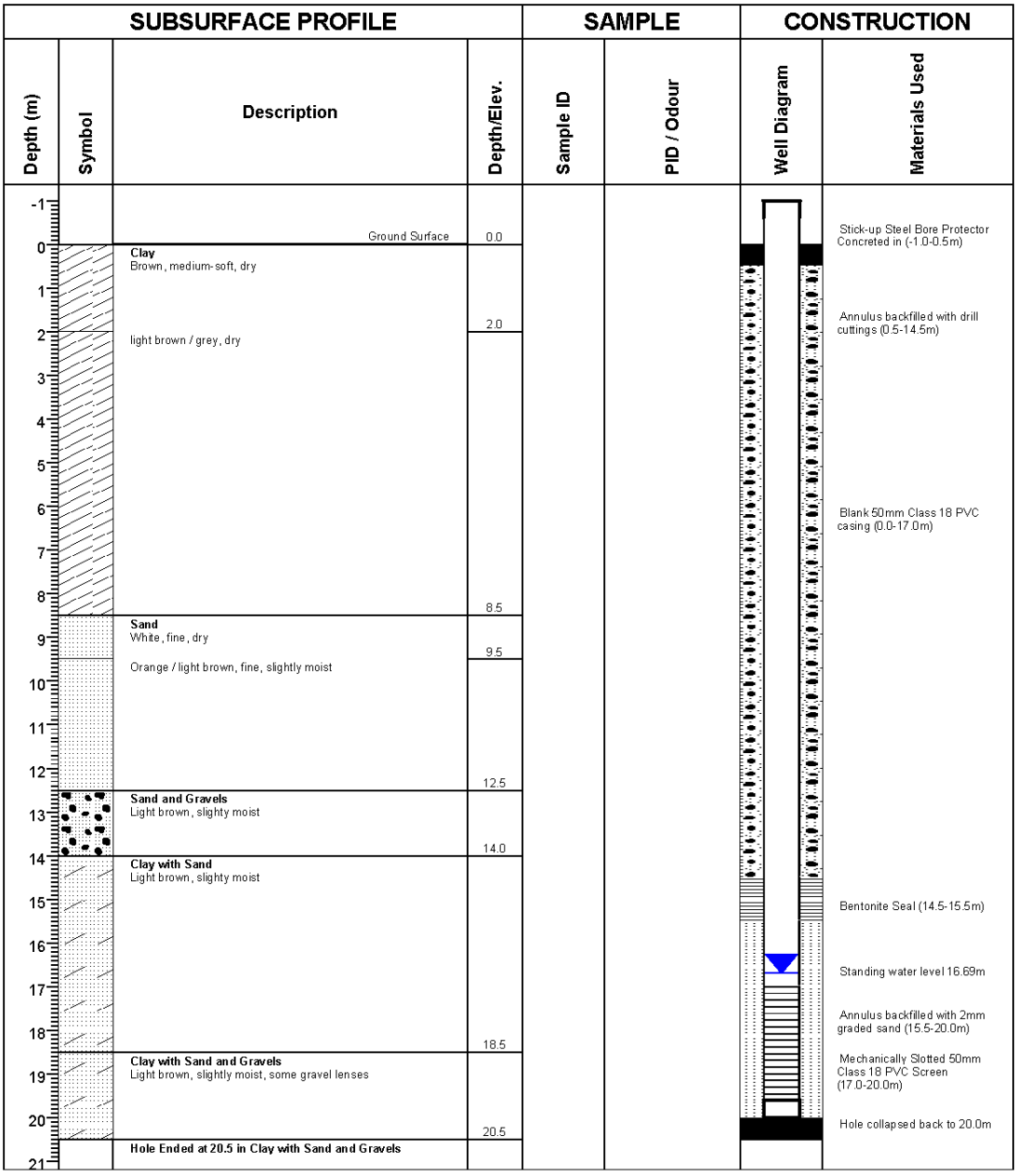

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 18 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW7

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				Stick-up Steel Bore Protector Concreted in (-1.0-0.5m)
0		**Clay** Brown, medium-soft, dry					
1							
			2.0				Annulus backfilled with drill cuttings (0.5-14.5m)
2		light brown / grey, dry					
3							
4							
5							
6							Blank 50mm Class 18 PVC casing (0.0-17.0m)
7			7.5				
8		Light brown, slightly moist					
9			9.5				
10		**Sand** White, fine, dry					
11							
12			12.5				
13		**Sandy Clay** Yellow / white, dry					
			14.5				
14		**Clay with Sand** Light brown, slighty moist					
15							Bentonite Seal (14.5-15.5m)
16							Annulus backfilled with 2mm graded sand (15.5-20.0m)
17							Mechanically Slotted 50mm Class 18 PVC Screen (17.0-20.0m)
18			18.5				
19		**Clay with Sand and Gravels** Light brown, slightly moist, some gravel lenses					Standing water level 18.49m
20			20.5				Hole collapsed back to 20.0m
21		**Hole Ended at 20.5 in Clay with Sand and Gravels**					

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 18 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

Borehole ID: MW8

Project No.: 2010-0070
Project Name: Nyngan Waste Disposal Facility Groundwater Monitoring Bores
Client: Bogan Shire Council
Site Address: Colane Road, Nyngan NSW

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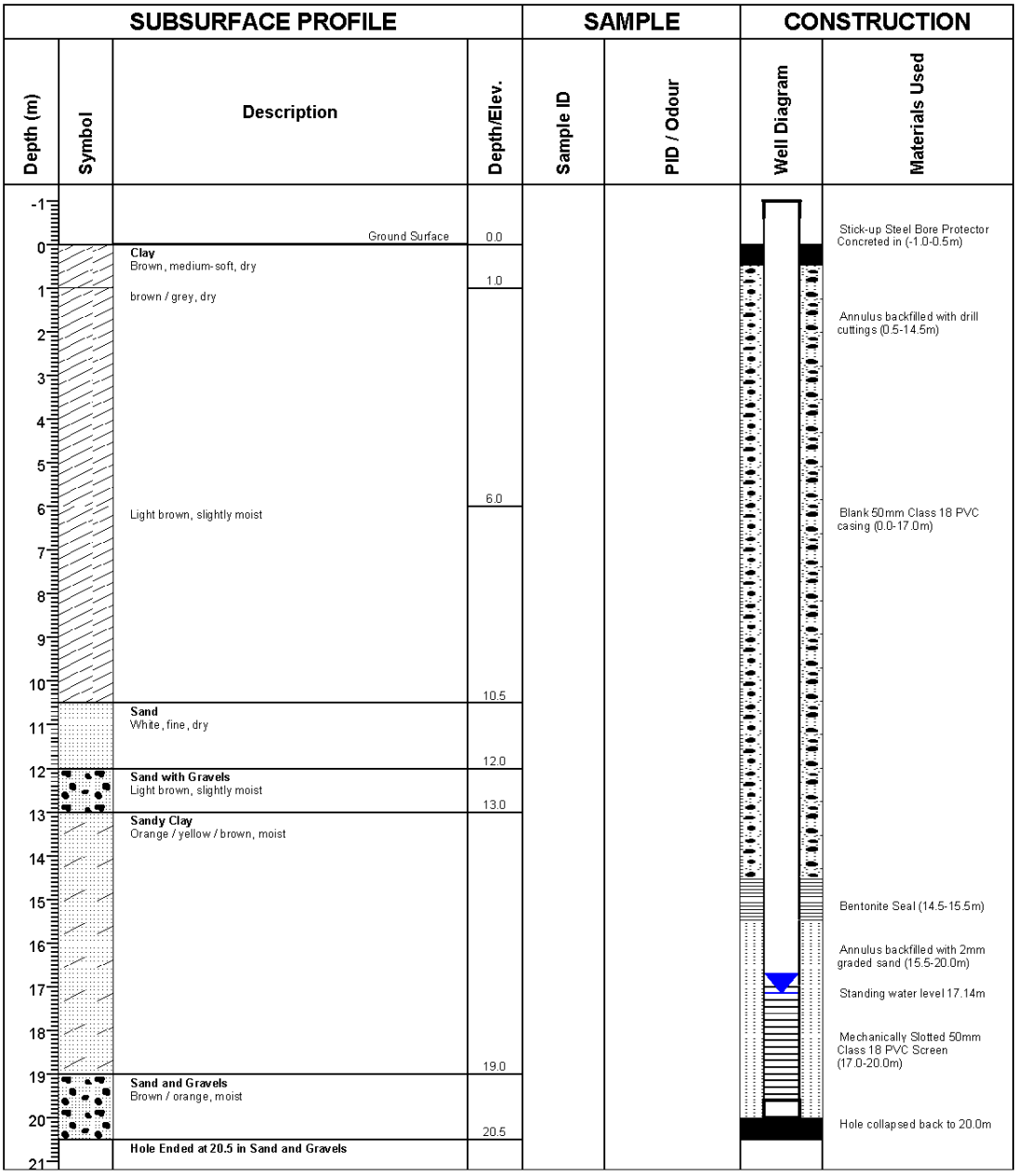

Drilled By: The Impax Group
Drill Method: Rotary Air
Drill Date: 19 June, 2010

Hole Size: 115 mm
Datum:
Sheet: 1 of 1

IMPAX group
ABN: 59 121 986 089

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18 January 2012

Mr Dean Woods
Environmental Health Officer
Bogan Shire Council
PO Box 211
NYNGAN NSW 2825

Dear Dean,

RE: NYNGAN LANDFILL GROUNDWATER MONITORING – JANUARY 2012

The Impax Group conducted baseline groundwater monitoring for the Nyngan Landfill Site in January 2012.

Groundwater samples from six groundwater monitoring bores (MB1, MB2, MB3, MB6, MB7 and MB8) were collected and submitted to the laboratory for analysis. Groundwater samples were not collected from MB5 and MB6 as were damaged and unsuitable for monitoring at the time of the groundwater sampling. Laboratory analytical results for groundwater samples are summarised in *Table A1 (Attachment A)*. Laboratory certificates of analysis for groundwater samples are presented as *Attachment B*.

If you have any questions regarding the information provided in this letter please contact the undersigned on (02) 6885 5536.

Kind Regards

Brendan Allen
Environmental Scientist
The Impax Group

2012-0002 Nyngan Landfill January_2012

List of Attachments

Attachment A	**Analytical Results Summary Table**
Attachment B	**Laboratory Certificate of Analysis**

Attachment A:

ANALYTICAL RESULTS SUMMARY TABLE

TABLE A1
2012-0002
Summary of Analytical Results - Nyngan Landfill Monitoring - Groundwater (µg/L)

Sample ID	Date	Standing Water Level (m)	pH (field)	pH (lab)	Electrical Conductivity (field)	Electrical Conductuvury (lab)	Biological Oxygen Demand (BOD-5) (mg/L)	Total Dissolved Solids (mg/L)	Sodium (Na) (mg/L)	Calcium (Ca) (mg/L)	Potassium (K) (mg/L)	Magnesium (Mg) (mg/L)	Chloride (mg/L)	Total Nitrate (N) (mg/L)	Sulphate SO_4 (mg/L)	Ionic Balance (%)	Total Phosphorous (P) (mg/L)	Phosphate as P (mg/L)	Total Kjeldahl Nitrogen(TKN) (mg/L)	Ammonia as N (mg/L)	Hydroxide Alkalinity (OH) as $CaCO_3$ (mg/L)	NOx as N (mg/L)
EQL		n/a	n/a	n/a	1	1	4	5	0.5	0.5	0.5	0.5	1	0.005	1	n/a	0.05	0.005	n/a	0.005	1	0.005
Groundwater																						
LF_MB1	3-Jan-12	16.86	6.57	6.8	>20,000	51,000	<4	37,000	12,000	1,100	53	1,800	19,000	0.039	4,500	5	<0.05	0.04	0.5	<0.05	<1	0.04
LF_MB2	3-Jan-12	16.99	7	6.9	9,930	38,000	5	25,000	8,000	710	40	1,200	14,000	0.038	3,300	0.93	0.3	0.03	2.2	0.02	<1	0.02
LF_MB3	3-Jan-12	17.06	6.77	6.9	18,250	38,000	<4	28,000	8,200	700	35	1,200	13,000	0.044	3,300	5.9	0.5	0.02	0.8	<0.005	<1	0.05
LF_MB6	4-Jan-12	16.93	6.91	6.9	>20,000	37,000	<4	25,000	7,900	580	39	1,000	14,000	0.095	3,500	-2.4	0.1	0.02	0.4	<0.005	<1	0.1
LF_MB7	3-Jan-12	17	6.77	6.8	>20,000	35,000	15	22,000	7,600	590	43	1,100	11,000	0.072	2,400	11	0.1	0.07	1	0.51	<1	0.08
LF_MB8	3-Jan-12	19.19	6.57	6.6	19,390	34,000	<4	23,000	7,300	550	40	960	11,000	0.13	2,500	6.3	<0.05	0.08	0.4	<0.005	<1	0.1

Results reported in µg/L unless otherwise specified

TABLE A1
2012-0002
Summary of Analytical Results - Nyngan Landfill Monitoring - Groundwater (µg/L)

Sample ID	Date	Bicarbonate Alkalinity as $CaCO_3$ (mg/L)	Carbonate Alkalinity as $CaCO_3$ (mg/L)	Total Alkalinity as CaCO3 (mg/L)	Faecal Coliforms (CFU/100ml)	Iron (Fe)	Lead (Pb)	Chromium (Cr)	Cadmium (Cd)	Zinc (Zn)	Arsenic (As(III))	Copper (Cu)	Nickel (Ni)	Mercury (Hg)	Total Organic Carbon (mg/L)	Phenolics (as Phenol) (mg/L)	TPH (C_6-C_9)	TPH (C_{10}-C_{14})	TPH (C_{15}-C_{28})	TPH (C_{29}-C_{36})	PCBs	PAHs
EQL		1	1	1	1	10	1	1	0.1	1	1	1	1	0.05	1	0.05	10	50	100	100	--	--
Groundwater																						
LF_MB1	3-Jan-12	570	<1	570	10 appx.	<10	<1	1	0.1	7	<1	6	51	<0.05	1	<0.05	<10	<50	<100	<100	<EQL	<EQL
LF_MB2	3-Jan-12	300	<1	300	<20	<10	<1	8	0.2	7	<1	<1	7	<0.05	4	<0.05	<10	<50	<100	<100	<EQL	<EQL
LF_MB3	3-Jan-12	290	<1	290	<20	<10	<1	5	<0.1	20	<1	3	11	<0.05	2	<0.05	<10	<50	<100	<100	<EQL	<EQL
LF_MB6	4-Jan-12	270	<1	270	<20	<10	<1	16	0.1	15	<1	14	9	<0.05	1	<0.05	<10	<50	<100	<100	<EQL	<EQL
LF_MB7	3-Jan-12	280	<1	280	<100	63	<1	8	<0.1	6	1	<1	27	<0.05	3	<0.05	<10	<50	<100	<100	<EQL	<EQL
LF_MB8	3-Jan-12	140	<1	140	<10	<10	<1	18	0.2	6	<1	5	10	<0.05	<1	<0.05	<10	<50	<100	<100	<EQL	<EQL

Results reported in µg/L unless otherwise specified

Attachment B:

LABORATORY CERTIFICATE OF ANALYSIS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS **67154**

Client:
The Impax Group Pty Ltd
PO Box 6157
Dubbo
NSW 2830

Attention: Brendan Allen

Sample log in details:

Your Reference:	**2012-0002 BSC - Landfill Monitoring Program**	
No. of samples:	7 Waters	
Date samples received / completed instructions received	05/01/12	/ 05/01/12

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	16/01/12	/ 16/01/12
Date of Preliminary Report:	Not Issued	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Nancy Zhang
Chemist

Nick Sarlamis
Inorganics Supervisor

Giovanni Agosti
Technical Manager

Tania Notaras
Manager

Jeremy Faircloth
Chemist

Envirolab Reference: 67154
Revision No: R 00

ACCREDITED FOR TECHNICAL COMPETENCE

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

vTRH in Water (C6-C9) Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date extracted	-	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012
Date analysed	-	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012
$TRHC_6 - C_9$	µg/L	<10	<10	<10	<10	<10
Surrogate Dibromofluoromethane	%	106	106	106	107	107
Surrogate toluene-d8	%	101	102	101	101	102
Surrogate 4-BFB	%	98	98	99	95	95

vTRH in Water (C6-C9) Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date extracted	-	05/01/2012	05/01/2012
Date analysed	-	05/01/2012	05/01/2012
$TRHC_6 - C_9$	µg/L	<10	<10
Surrogate Dibromofluoromethane	%	107	108
Surrogate toluene-d8	%	102	102
Surrogate 4-BFB	%	97	98

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

sTRH in Water (C10-C36)						
Our Reference:	UNITS	67154-1	67154-2	67154-3	67154-4	67154-5
Your Reference	----------	LF_MB1	LF_MB2	LF_MB3	LF_MB6	LF_MB7
Date Sampled	----------	03/01/2012	03/01/2012	03/01/2012	04/01/2012	03/01/2012
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
$TRHC_{10}$ - C_{14}	µg/L	<50	<50	<50	<50	<50
$TRHC_{15}$ - C_{28}	µg/L	<100	<100	<100	<100	<100
$TRHC_{29}$ - C_{36}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	83	104	109	101	106

sTRH in Water (C10-C36)			
Our Reference:	UNITS	67154-6	67154-7
Your Reference	----------	LF_MB8	LF_DupA
Date Sampled	----------	03/01/2012	04/01/2012
Type of sample		Water	Water
Date extracted	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
$TRHC_{10}$ - C_{14}	µg/L	<50	<50
$TRHC_{15}$ - C_{28}	µg/L	<100	<100
$TRHC_{29}$ - C_{36}	µg/L	<100	<100
Surrogate o-Terphenyl	%	97	98

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

PAHs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date extracted	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Naphthalene	µg/L	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1	<1
Benzo(b+k)fluoranthene	µg/L	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1	<1
Surrogate p-Terphenyl-d_{14}	%	86	104	100	99	97

PAHs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date extracted	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
Naphthalene	µg/L	<1	<1
Acenaphthylene	µg/L	<1	<1
Acenaphthene	µg/L	<1	<1
Fluorene	µg/L	<1	<1
Phenanthrene	µg/L	<1	<1
Anthracene	µg/L	<1	<1
Fluoranthene	µg/L	<1	<1
Pyrene	µg/L	<1	<1
Benzo(a)anthracene	µg/L	<1	<1
Chrysene	µg/L	<1	<1
Benzo(b+k)fluoranthene	µg/L	<2	<2
Benzo(a)pyrene	µg/L	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1
Surrogate p-Terphenyl-d_{14}	%	97	92

Envirolab Reference: 67154
Revision No: R 00

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

PCBs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date extracted	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Arochlor 1016	µg/L	<2	<2	<2	<2	<2
Arochlor 1221	µg/L	<2	<2	<2	<2	<2
Arochlor 1232	µg/L	<2	<2	<2	<2	<2
Arochlor 1242	µg/L	<2	<2	<2	<2	<2
Arochlor 1248	µg/L	<2	<2	<2	<2	<2
Arochlor 1254	µg/L	<2	<2	<2	<2	<2
Arochlor 1260	µg/L	<2	<2	<2	<2	<2
Surrogate TCLMX	%	88	108	111	96	102

PCBs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date extracted	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
Arochlor 1016	µg/L	<2	<2
Arochlor 1221	µg/L	<2	<2
Arochlor 1232	µg/L	<2	<2
Arochlor 1242	µg/L	<2	<2
Arochlor 1248	µg/L	<2	<2
Arochlor 1254	µg/L	<2	<2
Arochlor 1260	µg/L	<2	<2
Surrogate TCLMX	%	101	109

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Total Phenolics in Water						
Our Reference:	UNITS	67154-1	67154-2	67154-3	67154-4	67154-5
Your Reference	----------	LF_MB1	LF_MB2	LF_MB3	LF_MB6	LF_MB7
Date Sampled	----------	03/01/2012	03/01/2012	03/01/2012	04/01/2012	03/01/2012
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Total Phenolics in Water			
Our Reference:	UNITS	67154-6	67154-7
Your Reference	----------	LF_MB8	LF_DupA
Date Sampled	----------	03/01/2012	04/01/2012
Type of sample		Water	Water
Date extracted	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date prepared	-	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012
Date analysed	-	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	1
Cadmium-Dissolved	µg/L	0.1	0.2	<0.1	0.1	<0.1
Chromium-Dissolved	µg/L	1	8	5	16	8
Copper-Dissolved	µg/L	6	<1	3	14	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	51	7	11	9	27
Zinc-Dissolved	µg/L	7	7	20	15	6
Iron-Dissolved	µg/L	<10	<10	<10	<10	63

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date prepared	-	11/1/2012	11/1/2012
Date analysed	-	11/1/2012	11/1/2012
Arsenic-Dissolved	µg/L	<1	<1
Cadmium-Dissolved	µg/L	0.2	0.1
Chromium-Dissolved	µg/L	18	17
Copper-Dissolved	µg/L	5	14
Lead-Dissolved	µg/L	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	10	9
Zinc-Dissolved	µg/L	6	15
Iron-Dissolved	µg/L	<10	<10

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date prepared	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
pH	pH Units	6.8	6.9	6.9	6.9	6.8
Electrical Conductivity	µS/cm	51,000	38,000	38,000	37,000	35,000
BOD5	mg/L	<4	5	<4	<4	15
Total Dissolved Solids (grav)	mg/L	37,000	25,000	28,000	25,000	22,000
Nitrate as N in water	mg/L	0.039	0.038	0.044	0.095	0.072
Phosphorus - Total	mg/L	<0.05	0.3	0.5	0.1	0.1
Phosphate as P in water	mg/L	0.04	0.03	0.02	0.02	0.07
TKN in water	mg/L	0.5	2.2	0.8	0.4	1.0
Ammonia as N in water	mg/L	<0.05	0.02	<0.005	<0.005	0.51
NOx as N in water	mg/L	0.04	0.02	0.05	0.1	0.08
Total Organic Carbon	mg/L	1	4	2	1	3

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date prepared	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
pH	pH Units	6.6	6.9
Electrical Conductivity	µS/cm	34,000	37,000
BOD5	mg/L	<4	<4
Total Dissolved Solids (grav)	mg/L	23,000	27,000
Nitrate as N in water	mg/L	0.13	0.10
Phosphorus - Total	mg/L	<0.05	0.1
Phosphate as P in water	mg/L	0.08	0.02
TKN in water	mg/L	0.4	0.4
Ammonia as N in water	mg/L	<0.005	0.007
NOx as N in water	mg/L	0.1	0.1
Total Organic Carbon	mg/L	<1	1

Envirolab Reference: 67154
Revision No: R 00

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-1 LF_MB1 03/01/2012 Water	67154-2 LF_MB2 03/01/2012 Water	67154-3 LF_MB3 03/01/2012 Water	67154-4 LF_MB6 04/01/2012 Water	67154-5 LF_MB7 03/01/2012 Water
Date prepared	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Calcium - Dissolved	mg/L	1,100	710	700	580	590
Potassium - Dissolved	mg/L	53	40	35	39	43
Sodium - Dissolved	mg/L	12,000	8,000	8,200	7,900	7,600
Magnesium - Dissolved	mg/L	1,800	1,200	1,200	1,000	1,100
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	570	300	290	270	280
Carbonate Alkalinity as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	570	300	290	270	280
Sulphate, SO4	mg/L	4,500	3,300	3,300	3,500	2,400
Chloride, Cl	mg/L	19,000	14,000	13,000	14,000	11,000
Ionic Balance	%	5.0	0.93	5.9	-2.4	11

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	67154-6 LF_MB8 03/01/2012 Water	67154-7 LF_DupA 04/01/2012 Water
Date prepared	-	06/01/2012	06/01/2012
Date analysed	-	06/01/2012	06/01/2012
Calcium - Dissolved	mg/L	550	590
Potassium - Dissolved	mg/L	40	41
Sodium - Dissolved	mg/L	7,300	8,200
Magnesium - Dissolved	mg/L	960	1,100
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<1	<1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	140	260
Carbonate Alkalinity as $CaCO_3$	mg/L	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	140	260
Sulphate, SO4	mg/L	2,500	2,900
Chloride, Cl	mg/L	11,000	12,000
Ionic Balance	%	6.3	6.4

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Microbiologocal Testing						
Our Reference:	UNITS	67154-1	67154-2	67154-3	67154-4	67154-5
Your Reference	----------	LF_MB1	LF_MB2	LF_MB3	LF_MB6	LF_MB7
Date Sampled	----------	03/01/2012	03/01/2012	03/01/2012	04/01/2012	03/01/2012
Type of sample		Water	Water	Water	Water	Water
Date testing started	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Date testing completed	-	06/01/2012	06/01/2012	06/01/2012	06/01/2012	06/01/2012
Faecal Coliforms	CFU/100mL	10 approximate	<20	<20	<20	<100

Microbiologocal Testing			
Our Reference:	UNITS	67154-6	67154-7
Your Reference	----------	LF_MB8	LF_DupA
Date Sampled	----------	03/01/2012	04/01/2012
Type of sample		Water	Water
Date testing started	-	06/01/2012	06/01/2012
Date testing completed	-	06/01/2012	06/01/2012
Faecal Coliforms	CFU/100mL	<10	<10

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-030	Total Phenolics - determined colorimetrically following disitillation, based upon APHA 21st ED 5530 D.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
Ext-020	Analysis subcontracted to Australian Government - National Measurement Institute. NATA Accreditation No: 198
Inorg-018	Total Dissolved Solids - determined gravimetrically in accordance with APHA 21st ED, 2540-C.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 21st ED NO3- F. Soils are analysed following a water extraction.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA 21st ED 4500 P E. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA 21st ED 4500 Norg.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 21st ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. DOC is filtered prior to determination. Analysis using APHA 21st ED 5310B.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 21st ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 21st ED 2540B.
Ext-008	Subcontracted to Barratt & Smith Pathlogy. NATA Accreditation No. 2178.

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

QUALITY CONTROL vTRH in Water (C6-C9)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			05/01/2012	[NT]	[NT]	LCS-W1	05/01/2012
Date analysed	-			05/01/2012	[NT]	[NT]	LCS-W1	05/01/2012
TRHC6 - C9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	98%
Surrogate Dibromofluoromethane	%		Org-013	89	[NT]	[NT]	LCS-W1	96%
Surrogate toluene-d8	%		Org-013	97	[NT]	[NT]	LCS-W1	102%
Surrogate 4-BFB	%		Org-013	92	[NT]	[NT]	LCS-W1	100%
QUALITY CONTROL sTRH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
Date analysed	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
TRHC10 - C14	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	67%
TRHC15 - C28	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	83%
TRHC29 - C36	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	71%
Surrogate o-Terphenyl	%		Org-003	83	[NT]	[NT]	LCS-W1	87%
QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
Date analysed	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
Naphthalene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	97%
Acenaphthylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Fluorene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	93%
Phenanthrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	97%
Anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	99%
Pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	101%
Benzo(a)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	88%
Benzo(b+k)fluoranthene	µg/L	2	Org-012 subset	<2	[NT]	[NT]	[NR]	[NR]

Envirolab Reference: 67154
Revision No: R 00

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	89%
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	100	[NT]	[NT]	LCS-W1	92%
QUALITY CONTROL PCBs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
Date analysed	-			06/01/2012	[NT]	[NT]	LCS-W1	06/01/2012
Arochlor 1016	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	µg/L	2	Org-006	<2	[NT]	[NT]	LCS-W1	105%
Arochlor 1260	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	89	[NT]	[NT]	LCS-W1	105%
QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-1	06/01/2012
Date analysed	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-1	06/01/2012
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-030	<0.05	67154-1	<0.05 || <0.05	LCS-1	96%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			11/1/2012	67154-1	11/1/2012 || 11/1/2012	LCS-W1	11/1/2012
Date analysed	-			11/1/2012	67154-1	11/1/2012 || 11/1/2012	LCS-W1	11/1/2012
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	<1 || <1	LCS-W1	92%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	67154-1	0.1 || 0.2 || RPD: 67	LCS-W1	100%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	1 || 1 || RPD: 0	LCS-W1	85%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	6 || 7 || RPD: 15	LCS-W1	86%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	<1 || <1	LCS-W1	101%

Envirolab Reference: 67154
Revision No: R 00

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	67154-1	<0.05 || <0.05	LCS-W1	108%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	51 || 52 || RPD: 2	LCS-W1	98%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	67154-1	7 || 7 || RPD: 0	LCS-W1	84%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	67154-1	<10 || 10	LCS-W1	84%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-W1	06/01/2012
Date analysed	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-W1	06/01/2012
pH	pH Units		Inorg-001	[NT]	67154-1	6.8 || 6.8 || RPD: 0	LCS-W1	100%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	67154-1	51000 || 52000 || RPD: 2	LCS-W1	104%
BOD5	mg/L	4	Ext-020	<4	67154-1	<4 || [N/T]	LCS-W1	114%
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	67154-1	37000 || 38000 || RPD: 3	LCS-W1	95%
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	67154-1	0.039 || 0.039 || RPD: 0	LCS-W1	99%
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	67154-1	<0.05 || <0.05	LCS-W1	94%
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	67154-1	0.04 || 0.04 || RPD: 0	LCS-W1	87%
TKN in water	mg/L	0.1	Inorg-062	<0.1	67154-1	0.5 || 0.5 || RPD: 0	LCS-W1	11%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	67154-1	<0.05 || <0.05	LCS-W1	103%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	67154-1	0.04 || 0.04 || RPD: 0	LCS-W1	99%
Total Organic Carbon	mg/L	1	Inorg-079	<1	67154-1	1 || 1 || RPD: 0	LCS-W1	97%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-W1	06/01/2012
Date analysed	-			06/01/2012	67154-1	06/01/2012 || 06/01/2012	LCS-W1	06/01/2012
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	67154-1	1100 || 1100 || RPD: 0	LCS-W1	99%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	67154-1	53 || 53 || RPD: 0	LCS-W1	98%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	67154-1	12000 || 11000 || RPD: 9	LCS-W1	102%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	67154-1	1800 || 1800 || RPD: 0	LCS-W1	104%
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1	Inorg-006	<1	67154-1	570 || 580 || RPD: 2	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	1	Inorg-006	<1	67154-1	<1 || <1	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	1	Inorg-006	<1	67154-1	570 || 580 || RPD: 2	LCS-W1	103%
Sulphate, SO4	mg/L	1	Inorg-081	<1	67154-1	4500 || 4300 || RPD: 5	LCS-W1	100%

Envirolab Reference: 67154
Revision No: R 00

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Chloride, Cl	mg/L	1	Inorg-081	<1	67154-1	19000 || 18000 || RPD: 5	LCS-W1	89%
Ionic Balance	%		Inorg-041	[NT]	67154-1	5.0 || 6.9 || RPD: 32	[NR]	[NR]

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			06/01/2012
Date testing completed	-			06/01/2012
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

QUALITY CONTROL Total Phenolics in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	67154-2	06/01/2012
Date analysed	-	[NT]	[NT]	67154-2	06/01/2012
Total Phenolics (as Phenol)	mg/L	[NT]	[NT]	67154-2	82%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	67154-2	12/01/2012
Date analysed	-	[NT]	[NT]	67154-2	12/01/2012
pH	pH Units	[NT]	[NT]	[NR]	[NR]
Electrical Conductivity	µS/cm	[NT]	[NT]	[NR]	[NR]
BOD5	mg/L	[NT]	[NT]	[NR]	[NR]
Total Dissolved Solids (grav)	mg/L	[NT]	[NT]	[NR]	[NR]
Nitrate as N in water	mg/L	[NT]	[NT]	67154-2	84%
Phosphorus - Total	mg/L	[NT]	[NT]	67154-2	88%
Phosphate as P in water	mg/L	[NT]	[NT]	67154-2	94%
TKN in water	mg/L	[NT]	[NT]	67154-2	103%
Ammonia as N in water	mg/L	[NT]	[NT]	67154-2	114%
NOx as N in water	mg/L	[NT]	[NT]	67154-2	84%
Total Organic Carbon	mg/L	[NT]	[NT]	67154-2	99%

Client Reference: 2012-0002 BSC - Landfill Monitoring Program

Report Comments:
BOD analysed by NMI RN894816

MICRO analysed by SONIC W1200145. Note that competeing background in the sample may have reduced the count obtained.

Ammonia:PQL raised due to sample matrix.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions
Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria
Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

IMPAX group
ABN: 59 121 986 089

Lot 100 Williams Circuit
PO Box 6157
Dubbo NSW 2830

Ph: (02) 6885 5536
Fx: (02) 6885 3382

6 December 2012

The General Manager
Bogan Shire Council
PO Box 211
NYNGAN NSW 2825

RE: BOGAN SHIRE COUNCIL ENVIRONMENTAL MONITORING

The Impax Group conducted a round of environmental monitoring on behalf of Bogan Shire Council (BSC) in November 2012. Monitoring was conducted at the following locations:

- Groundwater monitoring – six wells at BSC landfill;
- Groundwater monitoring – five wells at BSC effluent irrigation area;
- Surface water monitoring – two locations at BSC effluent irrigation area; and
- Soil monitoring – three locations at BSC effluent irrigation area.

Groundwater monitoring at the BSC landfill site was conducted in accordance with NSW EPA (January 1996): '*Environmental Guidelines – Solid Waste Landfills*'.

Groundwater, surface water and soil monitoring at the BSC effluent irrigation area was conducted in accordance with Environment Protection Licence No# 3298 issued to BSC under the NSW *Protection of Environment Operations Act* 1997.

Groundwater, surface water and soil samples were collected at the locations shown in *Figure 1* (BSC Landfill) and *Figure 2* (BSC effluent irrigation area) of *Attachment A*.

Laboratory analytical results for groundwater, surface water and soil samples are summarised in *Table B1*, *Table B2*, *Table B3*, and *Table B4* of *Attachment B*. Laboratory certificates of analysis for groundwater samples are presented as *Attachment C*.

Laboratory analytical results from previous monitoring rounds conducted in March 2011 and January 2012 are also presented in *Table B1*, *Table B2*, *Table B3*, and *Table B4* of *Attachment B*.

If you have any questions regarding the information provided in this letter please contact the undersigned on (02) 6885 5536.

Kind Regards

Brendan Allen
Environmental Scientist
The Impax Group

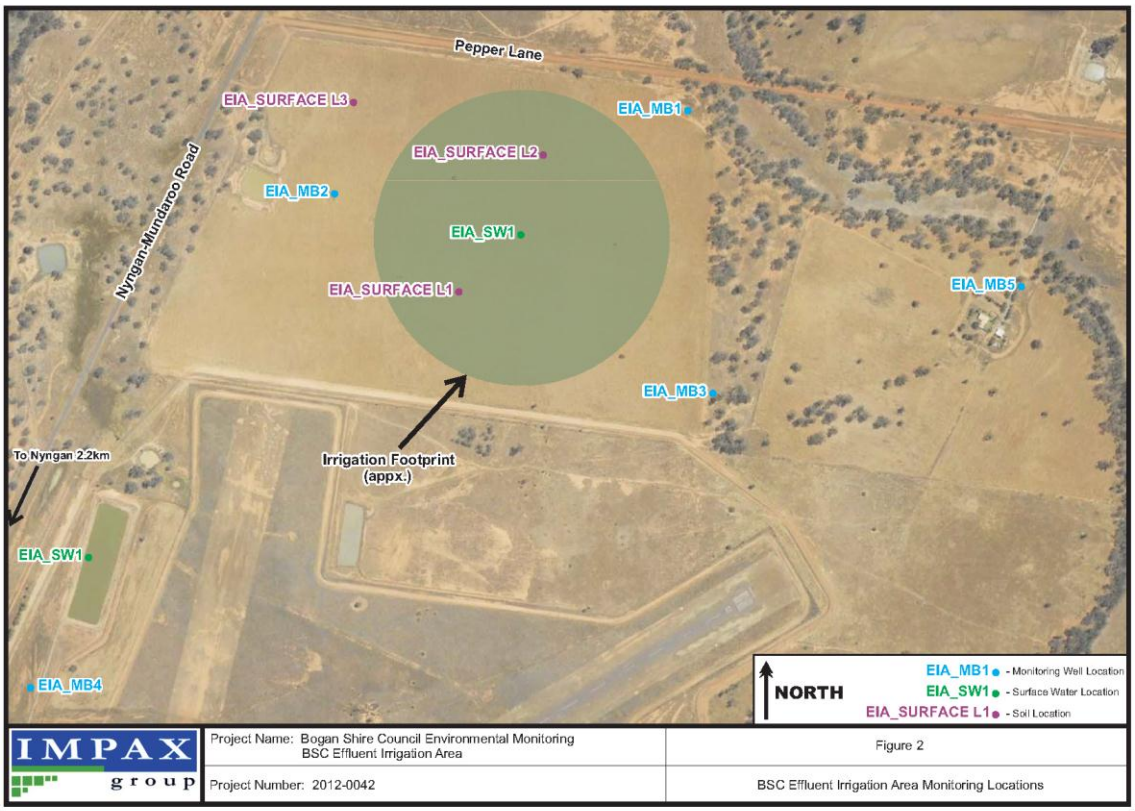
2012-0042 BSC Environmental Monitoring

List of Attachments

Attachment A	**Figures**
Attachment B	**Analytical Results Summary Table**
Attachment C	**Laboratory Certificate of Analysis**

Attachment A: Figures


BSC Landfill Current Footprint
LF_MW7
LF_MW8
LF_MW6
To Nyngan 5.5km
LF_MW1
LF_MW2
LF_MW3
Nyngan-Mundaroo Road
NORTH
LF_MW1 - Monitoring Well Location
IMPAX group
Project Name: Bogan Shire Council Environmental Monitoring
BSC Landfill
Figure 1
Project Number: 2012-0042
BSC Landfill Monitoring Locations


Pepper Lane
EIA_SURFACE L3
EIA_MB1
EIA_SURFACE L2
Nyngan-Mundaroo Road
EIA_MB2
EIA_SW1
EIA_SURFACE L1
EIA_MB5
EIA_MB3
To Nyngan 2.2km
Irrigation Footprint
(appx.)
EIA_SW1
EIA_MB4
NORTH
EIA_MB1 - Monitoring Well Location
EIA_SW1 - Surface Water Location
EIA_SURFACE L1 - Soil Location
IMPAX group
Project Name: Bogan Shire Council Environmental Monitoring
BSC Effluent Irrigation Area
Figure 2
Project Number: 2012-0042
BSC Effluent Irrigation Area Monitoring Locations

Attachment B:
Analytical Results Summary Table

TABLE B1
Summary of Analytical Results - Landfill Groundwater Monitoring (mg/L)
Bogan Shire Council

Sample ID	Sample Date	Standing water level (m)	Absorbable organic halogens (AOX) (µg/L)	Alkalinity	Ammonia	Calcium	Chloride	Fluoride	Iron (µg/L)	Magnesium	Manganese (µg/L)	Nitrate	pH	Total phenolics	Potassium	Sodium	Sulphate	Total organic carbon (TOC)
Lab EQL			10	5	0.005	0.5	1	0.1	10	0.5	5	0.005	*n/a*	0.05	0.5	0.5	1	1
LF_MW1	03-Jan-12	16.863	--	570	--	1100	19000	--	<10	1800	--	0.039	6.8	<0.05	53	1200	4500	1
LF_MW2	03-Jan-12	16.999	--	300	--	710	14000	--	<10	1200	--	0.038	6.9	<0.05	40	8000	3300	4
LF_MW3	03-Jan-12	17.063	--	290	--	700	13000	--	<10	1200	--	0.044	6.9	<0.05	35	8200	3300	2
LF_MW6	04-Jan-12	16.931	--	270	--	580	14000	--	<10	1000	--	0.095	6.9	<0.05	39	7900	3500	1
LF_MW7	03-Jan-12	17.004	--	280	--	590	11000	--	<10	1100	--	0.072	6.8	<0.05	43	7600	2400	3
LF_MW8	03-Jan-12	17.189	--	140	--	550	11000	--	<10	960	--	0.13	6.6	<0.05	40	7300	2500	<1
LF_MW1	13-Nov-12	17.051	460	600	0.13	1100	18000	0.40	10	1800	35	0.16	7.0	<0.05	59	12000	4600	5
LF_MW2	13-Nov-12	16.915	360	320	0.035	720	14000	0.46	<10	1200	15	0.19	7.1	<0.05	47	8500	3200	1
LF_MW3	13-Nov-12	17.015	460	330	<0.005	730	12000	0.43	<10	1200	5	0.13	7.1	<0.05	41	8600	3600	1
LF_MW6	14-Nov-12	17.16	552	280	0.013	660	12000	0.39	<10	1200	5	0.24	6.8	<0.05	43	8200	3100	1
LF_MW7	14-Nov-12	17.201	515	300	0.14	650	11000	0.36	260	1100	40	0.11	6.9	<0.05	44	7300	3000	1
LF_MW8	14-Nov-12	17.139	331	150	0.041	550	10000	0.32	<10	930	120	0.28	6.7	<0.05	41	7000	2800	2

TABLE B2
Summary of Analytical Results - Effluent Irrigation Area Groundwater Monitoring (mg/L)
Bogan Shire Council

Sample ID	Sampling Date	Standing water level (m)	Calcium	Conductivity (mS/cm)	Magnesium	Nitrate	pH	Potassium	Sodium	Sodium Adsorption Ratio (%)	Thermotolerant coliforms (CFU/100mL)	Total Phosphorous
EQL		*n/a*	0.5	1	0.5	0.005	*n/a*	0.5	0.5	0.01	20	0.05
EIA_MB1	15-Mar-11	15.935	600	39.0	1100	<0.005	7.3	64	12000	64	<20	1.4
EIA_MB2	15-Mar-11	15.872	490	36.0	1100	0.8	7.5	74	11000	61	340	0.5
EIA_MB3	15-Mar-11	15.935	440	33.0	930	0.4	7.5	41	8800	54	20	2.8
EIA_MB4	*not sampled*	--	--	--	--	--	--	--	--	--	--	--
EIA_MB5	15-Mar-11	15.776	130	17.0	260	7.8	7.7	23	5000	57	<20	1.9
EIA_MB1	02-Jan-12	15.931	620	39.0	1200	<0.005	6.5	38	8300	45	<20	0.09
EIA_MB2	02-Jan-12	15.770	510	38.0	1100	0.27	6.7	41	7600	43	300	0.3
EIA_MB3	02-Jan-12	15.813	480	38.0	1000	0.15	6.6	32	7700	45	10 (appx)	0.2
EIA_MB4	*not sampled*	--	--	--	--	--	--	--	--	--	--	--
EIA_MB5	02-Jan-12	15.755	140	19.0	280	6.8	6.9	18	3900	43	1000	0.07
EIA_MB1	12-Nov-12	15.925	690	35.8	1300	0.014	6.5	47	9000	47	40 (appx)	<0.05
EIA_MB2	12-Nov-12	15.705	550	33.9	1100	0.45	7.0	57	9000	50	30 (appx)	0.2
EIA_MB3	12-Nov-12	15.840	570	35.5	1200	0.36	6.9	46	9500	51	20	0.1
EIA_MB4	13-Nov-12	13.050	0.9	1.8	2.8	11	7.5	2.8	370	37	<20	0.6
EIA_MB5	13-Nov-12	15.750	140	16.3	290	6.5	7.1	18	4100	45	70	0.6

TABLE B3
Summary of Analytical Results - Effluent Irrigation Area Surface Water Monitoring (µg/L)
Bogan Shire Council

Sample ID	Sampling Date	Biochemical oxygen demand	Nitrogen (total)	Oil and grease	Phosphorous (total)	Total suspended solids
EQL		4	0.1	5	0.05	5
EIA_SW1	14-Nov-12	29	10	<5	6.2	230
EIA_SW2	14-Nov-12	27	9	<5	7.4	28

TABLE B4
Summary of Analytical Results - Effluent Irrigation Area Soil Monitoring (mg/kg)
Bogan Shire Council

Sample ID	Sampling Date	Available phosphorous (Cowell)	Available phosphorous (Bray)	Cation exchange capacity (meq/100g)	Conductivity (µS/cm)	Exchangeable aluminium (meq/100g)	Exchangeable calcium (meq/100g)	Exchangeable magnesium (meq/100g)	Exchangeable potassium (meq/100g)	Exchangeable sodium (meq/100g)	Exchangeable sodium percentage (%)	Nitrogen (total)	Organic carbon (%)	pH	Phosphorous (total)	Phosphorous sorption capacity (one point)
EQL		10	1	1	1	0.1	0.1	0.1	0.1	0.1	1	10	0.1	*n/a*	10	1
EIA_Surface L1	14-Mar-11	4097	41	8.8	170	<0.01	4.7	1.9	2.1	0.12	1.4	1000	1.10	6.3	420	12.6
EIA_Surface L2	14-Mar-11	3184	31	8	95	<0.01	4.3	1.4	2.2	0.084	1.1	990	0.90	6.3	320	32.0
EIA_Surface L3	14-Mar-11	3328	15	8.6	78	<0.01	4.5	2.5	1.2	0.36	4.2	570	0.80	6.7	240	32.0
EIA_Surface L1	13-Nov-12	62	74	7.3	190	<0.1	3.8	1.6	1.5	0.47	6.4	970	1.60	7.8	310	2.7
EIA_Surface L2	12-Nov-12	65	58	8.8	160	<0.1	4.9	1.7	1.9	0.46	5.3	810	1.40	7.9	350	3.0
EIA_Surface L3	12-Nov-12	26	15	5.8	49	<0.1	2.9	2.1	0.6	0.26	4.4	530	0.96	6.9	200	3.2

Attachment C:
Laboratory Certificates of Analysis

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS **81629**

Client:
The Impax Group Pty Ltd
PO Box 6157
Dubbo
NSW 2830

Attention: Brendan Allen

Sample log in details:

Your Reference:	**Bogan Shire Council**
No. of samples:	4 Waters, 4 Soils
Date samples received / completed instructions received	14/11/12 / 14/11/12

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/11/12 / 21/11/12
Date of Preliminary Report:	not issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Rhian Morgan
Reporting Supervisor

Nick Sarlamis
Inorganics Supervisor

Client Reference: Bogan Shire Council

Acid Extractable metals in soil					
Our Reference:	UNITS	81629-5	81629-6	81629-7	81629-8
Your Reference	----------	EIA_Surface L1	EIA_Surface L2	EIA_Surface L3	EIA_Dup A
Date Sampled	----------	13/11/2012	12/11/2012	12/11/2012	12/11/2012
Type of sample		Soil	Soil	Soil	Soil
Date digested	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
Date analysed	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
Phosphorus	mg/kg	310	350	200	370

Client Reference: Bogan Shire Council

Miscellaneous Inorg - soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81629-5 EIA_Surface L1 13/11/2012 Soil	81629-6 EIA_Surface L2 12/11/2012 Soil	81629-7 EIA_Surface L3 12/11/2012 Soil	81629-8 EIA_Dup A 12/11/2012 Soil
Date prepared	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
Date analysed	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
pH 1:5 soil:water	pH Units	7.8	7.9	6.9	7.7
Electrical Conductivity 1:5 soil:water	µS/cm	190	160	49	170
Total Nitrogen in soil	mg/kg	970	810	530	930
Total Organic Carbon (Walkley Black)	mg/kg	16,000	14,000	9,600	13,000
Colwell-Phosphorus*	mg/kg	62	65	26	64
Phosphate Sorption(one Point)		2.7	3.0	3.2	3.0
Bray Phosphorus*	mg/kg	74	58	15	57

Client Reference: Bogan Shire Council

ESP/CEC Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81629-5 EIA_Surface L1 13/11/2012 Soil	81629-6 EIA_Surface L2 12/11/2012 Soil	81629-7 EIA_Surface L3 12/11/2012 Soil	81629-8 EIA_Dup A 12/11/2012 Soil
Exchangeable Ca	meq/100g	3.8	4.9	2.9	5.2
Exchangeable K	meq/100g	1.5	1.9	0.6	1.9
Exchangeable Mg	meq/100g	1.6	1.7	2.1	1.8
Exchangeable Na	meq/100g	0.47	0.46	0.26	0.49
Exchangeable Al	meq/100g	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	meq/100g	7.3	8.8	5.8	9.3
ESP	%	6.4	5.3	4.4	5.3

Client Reference: Bogan Shire Council

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81629-1 EIA_MB1 12/11/2012 Water	81629-2 EIA_MB2 12/11/2012 Water	81629-3 EIA_MB3 12/11/2012 Water	81629-4 EIA_MB5 13/11/2012 Water
Date prepared	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
Date analysed	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
pH	pH Units	6.5	7.0	6.9	7.1
Electrical Conductivity	µS/cm	37,000	36,000	37,000	18,000
Phosphorus - Total	mg/L	<0.05	0.2	0.1	0.6
Nitrate as N in water	mg/L	0.014	0.45	0.36	6.5
Sodium Adsorption Ratio		47	50	51	45

Client Reference: Bogan Shire Council

Cations in water Dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81629-1 EIA_MB1 12/11/2012 Water	81629-2 EIA_MB2 12/11/2012 Water	81629-3 EIA_MB3 12/11/2012 Water	81629-4 EIA_MB5 13/11/2012 Water
Date digested	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	20/11/2012	20/11/2012	20/11/2012	20/11/2012
Sodium - Dissolved	mg/L	9,000	9,000	9,500	4,100
Potassium - Dissolved	mg/L	47	57	46	18
Calcium - Dissolved	mg/L	690	550	570	140
Magnesium - Dissolved	mg/L	1,300	1,100	1,200	290

Envirolab Reference: 81629
Revision No: R 00

Client Reference: Bogan Shire Council

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ---------- 	81629-1 EIA_MB1 12/11/2012 Water	81629-2 EIA_MB2 12/11/2012 Water	81629-3 EIA_MB3 12/11/2012 Water	81629-4 EIA_MB5 13/11/2012 Water
Date testing started	-	14/11/2012	14/11/2012	14/11/2012	14/11/2012
Date testing completed	-	15/11/2012	15/11/2012	15/11/2012	15/11/2012
Thermotolerant Coliforms	CFU/100mL	40 approx	30 approx	20	70

Client Reference: Bogan Shire Council

Method ID	Methodology Summary
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055/062	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen.
Inorg-036	Total Organic Matter - A titrimetric method that measures the oxidisable organic content of soils. Based upon Rayment and Lyons 2011.
Inorg-060 Colwell	Bicarbonate Extractable Elements, based on Rayment and Lyons, using 0.5M NaHCO3 at pH 8.5 as extraction fluid.
Ext-020	Analysis subcontracted to Australian Government - National Measurement Institute. NATA Accreditation No: 198
Inorg-060 Bray	Bray 1-Phosphorus, based on Rayment and Lyons, using 0.03M NH4F in 0.025M HCl as extraction fluid.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soil based on Rayment and Lyons 2011.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Metals-007	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
Ext-008	Subcontracted to Barratt & Smith Pathlogy. NATA Accreditation No. 2178.

Client Reference: Bogan Shire Council

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			15/11/2012	[NT]	[NT]	LCS-2	15/11/2012
Date analysed	-			15/11/2012	[NT]	[NT]	LCS-2	15/11/2012
Phosphorus	mg/kg	10	Metals-020 ICP-AES	<10	[NT]	[NT]	LCS-2	92%
QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/11/2012	81629-8	15/11/2012 || 15/11/2012	LCS-1	15/11/2012
Date analysed	-			15/11/2012	81629-8	15/11/2012 || 15/11/2012	LCS-1	15/11/2012
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	81629-8	7.7 || [N/T]	LCS-1	103%
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	81629-8	170 || [N/T]	LCS-1	108%
Total Nitrogen in soil	mg/kg	10	Inorg-055/062	<10	81629-8	930 || [N/T]	LCS-1	97%
Total Organic Carbon (Walkley Black)	mg/kg	1000	Inorg-036	<1000	81629-8	13000 || [N/T]	LCS-1	106%
Colwell-Phosphorus*	mg/kg	10	Inorg-060 Colwell	<10	81629-8	64 || [N/T]	LCS-1	106%
Phosphate Sorption(one Point)		1	Ext-020	<1.0	81629-8	3.0 || 3.0 || RPD: 0	LCS-1	99%
Bray Phosphorus*	mg/kg	1	Inorg-060 Bray	<1	81629-8	57 || [N/T]	LCS-1	109%
QUALITY CONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	81629-5	3.8 || 3.9 || RPD: 3	LCS-1	88%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	81629-5	1.5 || 1.7 || RPD: 12	LCS-1	80%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	81629-5	1.6 || 1.7 || RPD: 6	LCS-1	85%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	81629-5	0.47 || 0.51 || RPD: 8	LCS-1	86%
Exchangeable Al	meq/100g	0.1	Metals-009	<0.1	81629-5	<0.1 || <0.1	LCS-1	92%
Cation Exchange Capacity	meq/100g	1	Metals-009	<1.0	81629-5	7.3 || 7.8 || RPD: 7	[NR]	[NR]
ESP	%	1	Metals-009	<1.0	81629-5	6.4 || 6.5 || RPD: 2	[NR]	[NR]

Client Reference: Bogan Shire Council

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/11/2012	81629-1	15/11/2012 || 15/11/2012	LCS-W1	15/11/2012
Date analysed	-			15/11/2012	81629-1	15/11/2012 || 15/11/2012	LCS-W1	15/11/2012
pH	pH Units		Inorg-001	[NT]	81629-1	6.5 || 6.6 || RPD: 2	LCS-W1	103%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	81629-1	37000 || 37000 || RPD: 0	LCS-W1	106%
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	81629-1	<0.05 || [N/T]	LCS-W1	103%
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	81629-1	0.014 || [N/T]	LCS-W1	92%
Sodium Adsorption Ratio		0.01	Metals-007	<0.01	81629-1	47 || 46 || RPD: 2	[NR]	[NR]

QUALITY CONTROL Cations in water Dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			19/11/2012	81629-1	19/11/2012 || 19/11/2012	LCS-W3	19/11/2012
Date analysed	-			20/11/2012	81629-1	20/11/2012 || 20/11/2012	LCS-W3	20/11/2012
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81629-1	9000 || 8700 || RPD: 3	LCS-W3	84%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81629-1	47 || 46 || RPD: 2	LCS-W3	96%
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81629-1	690 || 660 || RPD: 4	LCS-W3	102%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81629-1	1300 || 1200 || RPD: 8	LCS-W3	98%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	81629-5	15/11/2012 || 15/11/2012	81629-8	15/11/2012
Date analysed	-	81629-5	15/11/2012 || 15/11/2012	81629-8	15/11/2012
Total Organic Carbon (Walkley Black)	mg/kg	81629-5	16000 || 15000 || RPD: 6	[NR]	[NR]
Colwell-Phosphorus*	mg/kg	81629-5	62 || 58 || RPD: 7	[NR]	[NR]
Phosphate Sorption(one Point)		81629-5	2.7 || [N/T]	81629-8	103%
Bray Phosphorus*	mg/kg	81629-5	74 || 57 || RPD: 26	[NR]	[NR]

Envirolab Reference: 81629
Revision No: R 00

Client Reference: Bogan Shire Council

Report Comments:
Phosphate Sorption analysed by NMI. Report No.RN944155.

Coliforms were analysed by Sonic report no W1216347.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions
Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria
Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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CERTIFICATE OF ANALYSIS **81723**

Client:
The Impax Group Pty Ltd
PO Box 6157
Dubbo
NSW 2830

Attention: Brendan Allen

Sample log in details:

Your Reference:	**Bogan Shire Council**	
No. of samples:	5 Waters	
Date samples received / completed instructions received	15/11/12	/ 15/11/12

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	22/11/12	/ 3/12/12
Date of Preliminary Report:	27/11/2012	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Rhian Morgan
Reporting Supervisor

Nick Sarlamis
Inorganics Supervisor

Client Reference: Bogan Shire Council

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81723-1 EIA_MB4 13/11/2012 Water	81723-2 LF_MW1 13/11/2012 Water	81723-3 LF_MW2 13/11/2012 Water	81723-4 LF_MW3 13/11/2012 Water	81723-5 LF_DupA 13/11/2012 Water
Date prepared	-	16/11/2012	16/11/2012	16/11/2012	16/11/2012	16/11/2012
Date analysed	-	16/11/2012	16/11/2012	16/11/2012	16/11/2012	16/11/2012
pH	pH Units	7.5	7.0	7.1	7.1	7.0
Electrical Conductivity	µS/cm	2,000	[NA]	[NA]	[NA]	[NA]
Phosphorus - Total	mg/L	0.6	[NA]	[NA]	[NA]	[NA]
Nitrate as N in water	mg/L	11	0.16	0.19	0.12	0.16
Sodium Adsorption Ratio		37	[NA]	[NA]	[NA]	[NA]
AOX in Water	µg/L	[NA]	460	360	460	470
Ammonia as N in water	mg/L	[NA]	0.13	0.035	<0.005	0.15
Fluoride, F	mg/L	[NA]	0.40	0.46	0.43	0.39
Total Organic Carbon	mg/L	[NA]	5	1	1	4

Client Reference: Bogan Shire Council

Total Phenolics in Water					
Our Reference:	UNITS	81723-2	81723-3	81723-4	81723-5
Your Reference	----------	LF_MW1	LF_MW2	LF_MW3	LF_DupA
Date Sampled	----------	13/11/2012	13/11/2012	13/11/2012	13/11/2012
Type of sample		Water	Water	Water	Water
Date extracted	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05

Envirolab Reference: 81723
Revision No: R 01

Client Reference: Bogan Shire Council

Microbiologocal Testing		
Our Reference:	UNITS	81723-1
Your Reference	----------	EIA_MB4
Date Sampled	----------	13/11/2012
Type of sample		Water
Date testing started	-	17/11/2012
Date testing completed	-	17/11/2012
Thermotolerant Coliforms	CFU/100mL	<20

Client Reference: Bogan Shire Council

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81723-1 EIA_MB4 13/11/2012 Water	81723-2 LF_MW1 13/11/2012 Water	81723-3 LF_MW2 13/11/2012 Water	81723-4 LF_MW3 13/11/2012 Water	81723-5 LF_DupA 13/11/2012 Water
Date prepared	-	16/11/2012	16/11/2012	16/11/2012	16/11/2012	16/11/2012
Date analysed	-	16/11/2012	16/11/2012	16/11/2012	16/11/2012	16/11/2012
Calcium - Dissolved	mg/L	0.9	1,100	720	730	1,000
Potassium - Dissolved	mg/L	2.8	59	47	41	49
Sodium - Dissolved	mg/L	370	12,000	8,500	8,600	10,000
Magnesium - Dissolved	mg/L	2.8	1,800	1,200	1,200	1,700
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NA]	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NA]	600	320	330	590
Carbonate Alkalinity as $CaCO_3$	mg/L	[NA]	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	[NA]	600	320	330	590
Sulphate, SO4	mg/L	[NA]	4,600	3,200	3,600	4,600
Chloride, Cl	mg/L	[NA]	18,000	14,000	12,000	18,000
Ionic Balance	%	[NA]	7.7	10	8.9	1.4

Client Reference: Bogan Shire Council

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81723-2 LF_MW1 13/11/2012 Water	81723-3 LF_MW2 13/11/2012 Water	81723-4 LF_MW3 13/11/2012 Water	81723-5 LF_DupA 13/11/2012 Water
Date prepared	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Iron-Dissolved	µg/L	10	<10	<10	20
Manganese-Dissolved	µg/L	35	15	5	15

Client Reference: Bogan Shire Council

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Metals-007	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
Ext-007	Subcontracted to Levay & Co. (SA)
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA 22nd ED, 4500-F-C.
Inorg-079	TOC determined using a TOC analyser using the combustion method. DOC is filtered prior to determination. Analysis using APHA 22nd ED 5310B.
Inorg-030	Total Phenolics - determined colorimetrically following disitillation, based upon APHA 22nd ED 5530 D.
Ext-008	Subcontracted to Barratt & Smith Pathlogy. NATA Accreditation No. 2178.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.

Client Reference: Bogan Shire Council

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/11/2012	81723-1	16/11/2012 || 16/11/2012	LCS-W1	16/11/2012
Date analysed	-			16/11/2012	81723-1	16/11/2012 || 16/11/2012	LCS-W1	16/11/2012
pH	pH Units		Inorg-001	[NT]	81723-1	7.5 || 7.5 || RPD: 0	LCS-W1	102%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	81723-1	2000 || 2000 || RPD: 0	LCS-W1	105%
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	81723-1	0.6 || [N/T]	LCS-W1	106%
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	81723-1	11 || 11 || RPD: 0	LCS-W1	101%
Sodium Adsorption Ratio		0.01	Metals-007	<0.01	81723-1	37 || [N/T]	[NR]	[NR]
AOX in Water	µg/L	10	Ext-007	<10.0	[NT]	[NT]	LCS-W1	98%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	LCS-W1	106%
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	LCS-W1	96%
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	LCS-W1	106%

QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/11/2012	[NT]	[NT]	LCS-W1	19/11/2012
Date analysed	-			19/11/2012	[NT]	[NT]	LCS-W1	19/11/2012
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-030	<0.05	[NT]	[NT]	LCS-W1	102%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			17/11/2012
Date testing completed	-			17/11/2012

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/11/2012	81723-1	16/11/2012 || 16/11/2012	LCS-W1	16/11/2012
Date analysed	-			16/11/2012	81723-1	16/11/2012 || 16/11/2012	LCS-W1	16/11/2012
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81723-1	0.9 || 0.9 || RPD: 0	LCS-W1	100%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81723-1	2.8 || 3.6 || RPD: 25	LCS-W1	120%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81723-1	370 || 450 || RPD: 20	LCS-W1	96%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	81723-1	2.8 || 2.8 || RPD: 0	LCS-W1	97%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NR]	[NR]

Client Reference: Bogan Shire Council

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	LCS-W1	118%
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	LCS-W1	103%
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	LCS-W1	102%
Ionic Balance	%		Inorg-041	[NT]	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/11/2012	81723-2	19/11/2012 II 19/11/2012	LCS-W1	19/11/2012
Date analysed	-			19/11/2012	81723-2	19/11/2012 II 19/11/2012	LCS-W1	19/11/2012
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	81723-2	10 II 10 II RPD: 0	LCS-W1	101%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	81723-2	35 II 25 II RPD: 33	LCS-W1	102%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	81723-2	16/11/2012 II 16/11/2012
Date analysed	-	81723-2	16/11/2012 II 16/11/2012
Electrical Conductivity	µS/cm	[NT]	[NT]
Phosphorus - Total	mg/L	[NT]	[NT]
Sodium Adsorption Ratio		[NT]	[NT]
AOX in Water	µg/L	81723-2	460 II 478 II RPD: 4
Total Organic Carbon	mg/L	81723-2	5 II 5 II RPD: 0

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	81723-4	16/11/2012
Date analysed	-	[NT]	[NT]	81723-4	16/11/2012
Calcium - Dissolved	mg/L	[NT]	[NT]	81723-4	#
Potassium - Dissolved	mg/L	[NT]	[NT]	81723-4	#
Sodium - Dissolved	mg/L	[NT]	[NT]	81723-4	#
Magnesium - Dissolved	mg/L	[NT]	[NT]	81723-4	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4	mg/L	[NT]	[NT]	[NR]	[NR]
Chloride, Cl	mg/L	[NT]	[NT]	[NR]	[NR]
Ionic Balance	%	[NT]	[NT]	[NR]	[NR]

Envirolab Reference: 81723
Revision No: R 01

Client Reference: Bogan Shire Council

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	81723-3	19/11/2012
Date analysed	-	[NT]	[NT]	81723-3	19/11/2012
Iron-Dissolved	µg/L	[NT]	[NT]	81723-3	92%
Manganese-Dissolved	µg/L	[NT]	[NT]	81723-3	95%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	81723-4	16/11/2012 || 16/11/2012
Date analysed	-	81723-4	16/11/2012 || 16/11/2012
pH	pH Units	81723-4	7.1 || [N/T]
Electrical Conductivity	µS/cm	[NT]	[NT]
Phosphorus - Total	mg/L	[NT]	[NT]
Nitrate as N in water	mg/L	81723-4	0.12 || [N/T]
Sodium Adsorption Ratio		[NT]	[NT]
AOX in Water	µg/L	81723-4	460 || 480 || RPD: 4
Ammonia as N in water	mg/L	81723-4	<0.005 || [N/T]
Fluoride, F	mg/L	81723-4	0.43 || [N/T]
Total Organic Carbon	mg/L	81723-4	1 || [N/T]

Client Reference: Bogan Shire Council

Report Comments:
Ion Balance: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

AOX analysed by LEVAY&CO. report number L&C-12-564

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions
Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria
Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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CERTIFICATE OF ANALYSIS **81783**

Client:
The Impax Group Pty Ltd
PO Box 6157
Dubbo
NSW 2830

Attention: Brendan Allen

Sample log in details:

Your Reference:	**Bogan Shire Council**	
No. of samples:	6 Waters	
Date samples received / completed instructions received	16/11/12	/ 16/11/12

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	23/11/12	/ 3/12/12
Date of Preliminary Report:	27/11/2012	

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Rhian Morgan
Reporting Supervisor

Nick Sarlamis
Inorganics Supervisor

Simon Mills
Group R&D Quality Manager

Envirolab Reference: 81783
Revision No: R 01

ACCREDITED FOR TECHNICAL COMPETENCE

Client Reference: Bogan Shire Council

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81783-1 LF-MW6 14/11/2012 Water	81783-2 LF-MW7 14/11/2012 Water	81783-3 LF-MW8 14/11/2012 Water	81783-4 EIA-SW1 14/11/2012 Water	81783-5 EIA-SW2 14/11/2012 Water
Date prepared	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	19/11/2012	19/11/2012	19/11/2012	19/11/2012	19/11/2012
pH	pH Units	6.8	6.9	6.7	[NA]	[NA]
Phosphorus - Total	mg/L	[NA]	[NA]	[NA]	6.2	7.4
Nitrate as N in water	mg/L	0.24	0.11	0.28	[NA]	[NA]
AOX in Water	µg/L	552	515	331	[NA]	[NA]
Ammonia as N in water	mg/L	0.013	0.14	0.041	[NA]	[NA]
Fluoride, F	mg/L	0.39	0.36	0.32	[NA]	[NA]
Total Organic Carbon	mg/L	1	1	2	[NA]	[NA]
BOD5	mg/L	[NA]	[NA]	[NA]	29	27
Total Nitrogen in water	mg/L	[NA]	[NA]	[NA]	10	9.0
Oil & Grease (LLE)	mg/L	[NA]	[NA]	[NA]	<5	<5
Total Suspended Solids @ 103-105°C	mg/L	[NA]	[NA]	[NA]	230	28

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81783-6 EIA-DUPB 14/11/2012 Water
Date prepared	-	19/11/2012
Date analysed	-	19/11/2012
Phosphorus - Total	mg/L	7.8
BOD5	mg/L	31
Total Nitrogen in water	mg/L	8.0
Oil & Grease (LLE)	mg/L	<5
Total Suspended Solids @ 103-105°C	mg/L	26

Client Reference: Bogan Shire Council

Total Phenolics in Water				
Our Reference:	UNITS	81783-1	81783-2	81783-3
Your Reference	----------	LF-MW6	LF-MW7	LF-MW8
Date Sampled	----------	14/11/2012	14/11/2012	14/11/2012
Type of sample		Water	Water	Water
Date extracted	-	20/11/2012	20/11/2012	20/11/2012
Date analysed	-	20/11/2012	20/11/2012	20/11/2012
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

Client Reference: Bogan Shire Council

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81783-1 LF-MW6 14/11/2012 Water	81783-2 LF-MW7 14/11/2012 Water	81783-3 LF-MW8 14/11/2012 Water
Date prepared	-	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	19/11/2012	19/11/2012	19/11/2012
Calcium - Dissolved	mg/L	660	650	550
Potassium - Dissolved	mg/L	43	44	41
Sodium - Dissolved	mg/L	8,200	7,300	7,000
Magnesium - Dissolved	mg/L	1,200	1,100	930
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	280	300	150
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	280	300	150
Sulphate, SO4	mg/L	3,100	3,000	2,800
Chloride, Cl	mg/L	12,000	11,000	10,000
Ionic Balance	%	8.5	8.3	7.3

Client Reference: Bogan Shire Council

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	81783-1 LF-MW6 14/11/2012 Water	81783-2 LF-MW7 14/11/2012 Water	81783-3 LF-MW8 14/11/2012 Water
Date prepared	-	19/11/2012	19/11/2012	19/11/2012
Date analysed	-	19/11/2012	19/11/2012	19/11/2012
Iron-Dissolved	µg/L	<10	260	<10
Manganese-Dissolved	µg/L	5	40	120

Client Reference: Bogan Shire Council

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Ext-007	Subcontracted to Levay & Co. (SA)
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA 22nd ED, 4500-F-C.
Inorg-079	TOC determined using a TOC analyser using the combustion method. DOC is filtered prior to determination. Analysis using APHA 22nd ED 5310B.
Ext-020	Analysis subcontracted to Australian Government - National Measurement Institute. NATA Accreditation No: 198
Inorg-055/062	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen.
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA 22nd ED, 5220-B.
Inorg-019	Suspended Solids - determined gravimetrcially by filtration of the sample, in accordance with APHA 22nd ED, 2540-D.
Inorg-030	Total Phenolics - determined colorimetrically following disitillation, based upon APHA 22nd ED 5530 D.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.

Client Reference: Bogan Shire Council

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/11/2012	81783-1	19/11/2012 || 19/11/2012	LCS-W1	19/11/2012
Date analysed	-			19/11/2012	81783-1	19/11/2012 || 19/11/2012	LCS-W1	19/11/2012
pH	pH Units		Inorg-001	[NT]	81783-1	6.8 || [N/T]	LCS-W1	102%
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	LCS-W1	104%
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	81783-1	0.24 || [N/T]	LCS-W1	106%
AOX in Water	µg/L	10	Ext-007	<10.0	81783-1	552 || [N/T]	LCS-W1	98%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	81783-1	0.013 || [N/T]	LCS-W1	105%
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	81783-1	0.39 || 0.38 || RPD: 3	LCS-W1	96%
Total Organic Carbon	mg/L	1	Inorg-079	<1	81783-1	1 || 1 || RPD: 0	LCS-W1	112%
BOD5	mg/L	4	Ext-020	<4	[NT]	[NT]	LCS-W1	91%
Total Nitrogen in water	mg/L	0.1	Inorg-055/062	<0.1	[NT]	[NT]	LCS-W1	88%
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	[NT]	[NT]	LCS-W1	89%
Total Suspended Solids @ 103-105°C	mg/L	5	Inorg-019	<5	[NT]	[NT]	LCS-W1	94%
QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/11/2012	[NT]	[NT]	LCS-W1	20/11/2012
Date analysed	-			20/11/2012	[NT]	[NT]	LCS-W1	20/11/2012
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-030	<0.05	[NT]	[NT]	LCS-W1	80%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/11/2012	[NT]	[NT]	LCS-W4	19/11/2012
Date analysed	-			19/11/2012	[NT]	[NT]	LCS-W4	19/11/2012
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W4	100%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W4	109%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W4	91%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W4	97%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	LCS-W4	104%
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	LCS-W4	104%

Envirolab Reference: 81783
Revision No: R 01

Client Reference: Bogan Shire Council

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	LCS-W4	107%
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	LCS-W4	107%
Ionic Balance	%		Inorg-041	[NT]	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/11/2012	[NT]	[NT]	LCS-W1	19/11/2012
Date analysed	-			19/11/2012	[NT]	[NT]	LCS-W1	19/11/2012
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W1	91%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W1	91%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	81783-4	19/11/2012 || 19/11/2012
Date analysed	-	81783-4	19/11/2012 || 19/11/2012
pH	pH Units	[NT]	[NT]
Phosphorus - Total	mg/L	81783-4	6.2 || [N/T]
Nitrate as N in water	mg/L	[NT]	[NT]
AOX in Water	µg/L	[NT]	[NT]
Ammonia as N in water	mg/L	[NT]	[NT]
Fluoride, F	mg/L	[NT]	[NT]
Total Organic Carbon	mg/L	[NT]	[NT]
BOD5	mg/L	81783-4	29 || [N/T]
Total Nitrogen in water	mg/L	81783-4	10 || 9.0 || RPD: 11
Oil & Grease (LLE)	mg/L	81783-4	<5 || [N/T]
Total Suspended Solids @ 103-105°C	mg/L	81783-4	230 || [N/T]

Envirolab Reference: 81783
Revision No: R 01

Client Reference: **Bogan Shire Council**

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	81783-3	19/11/2012 || 19/11/2012
Date analysed	-	81783-3	19/11/2012 || 19/11/2012
pH	pH Units	81783-3	6.7 || [N/T]
Phosphorus - Total	mg/L	[NT]	[NT]
Nitrate as N in water	mg/L	81783-3	0.28 || [N/T]
AOX in Water	µg/L	81783-3	331 || 313 || RPD: 6
Ammonia as N in water	mg/L	81783-3	0.041 || [N/T]
Fluoride, F	mg/L	81783-3	0.32 || [N/T]
Total Organic Carbon	mg/L	81783-3	2 || [N/T]
BOD5	mg/L	[NT]	[NT]
Total Nitrogen in water	mg/L	[NT]	[NT]
Oil & Grease (LLE)	mg/L	[NT]	[NT]
Total Suspended Solids @ 103-105^{O}C	mg/L	[NT]	[NT]

Client Reference: Bogan Shire Council

Report Comments:
BOD analysed by NMI report number RN 945323

AOX analysed by LEVAY&CO. report number L&C-12-565

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
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