AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

March 2016 Monitoring Report:
Tiedman Irrigation Program
EPL 20358

Reporting Period: January – February 2016

AGL Upstream Investments Pty Ltd
ABN 58 115 063 744
Locked Bag 1837, St Leonards NSW 2065
Level 22, 101 Miller Street, North Sydney NSW 2060
Telephone: 02 9921 2999 Facsimile: 02 9921 2474
Complaints Line (24 hours): 1300 799 716

Foreword

PREMISES	Gloucester Coal Seam Gas Project Bucketts Way Gloucester NSW 2422
LICENCE DETAILS	Environment Protection Licence 20358
LICENCEE	AGL Upstream Investments Pty Limited (AGL)
LICENCEE'S ADDRESS	Locked Bag 1837, North Sydney, NSW 2060
MONITORING DATE	23 January and 22 - 24 February 2016
MONITORING BY	Parsons Brinckerhoff, on behalf of AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work orders: ES1601841, ES1603977 and ES1604106)
DATE AGL OBTAINED DATA	17 February and 3 March 2016
REPORT DATE	8 March 2016
REPORT PREPARED BY	Nicola Fry, Hydrogeologist

Introduction

On 4 February 2016 AGL Upstream Investments Pty Ltd (AGL) announced that the GGP will not proceed to final investment stage. AGL will relinquish Petroleum Exploration Licence (PEL) 285 to the NSW Government and will commence a comprehensive decommissioning and rehabilitation program for well sites and other infrastructure in the Gloucester region.

A dedicated water monitoring network is in place which has enabled the collection of baseline water level and water quality data for the different groundwater and surface water systems within the Gloucester Basin. There are currently more than 50 dedicated water monitoring locations and more than five years of baseline monitoring (water levels and water quality) across the Gloucester Basin.

This Monitoring Report relates to the water monitoring activities specified in Part 5, Monitoring and Recording Conditions, of the Environment Protection Licence 20358. This report relates specifically to the monitoring surrounding the Tiedman Irrigation Program, and details:

1. Monitoring results from a catch dam overflow event at the Tiedman Irrigation Program (23 January 2016); and
2. Monitoring results from quarterly water sampling event at the Tiedman Irrigation Program (22 – 24 February 2016).

As per the Licence, the monitoring encompasses the monitoring points at the locations as shown in Table 1 and Figure 1. The specific analytes and frequency tested are shown in Table 2. The monitoring results for this reporting period are shown in Table 3, Table 4, and Table 5.

The monitoring points that are the subject of this report are part of the GGP groundwater monitoring network, as described in AGL's Water Management Plan for the Tiedman Irrigation Program (AGL, 2012a) and Soil Quality Monitoring and Management Program (AGL, 2012b)). Water monitoring results for the irrigation program are presented in a baseline water monitoring report (PB, 2013a) and six-monthly compliance reports (PB, 2013a, 2013b, 2014a, 2014b, 2015a, and 2015b).

The following sampling methods were used to obtain surface water and groundwater samples:

- Submersible 12V pump at the groundwater monitoring bores screened within relatively permeable geological materials: TMB01, TMB02 and TMB03. A minimum of three well volumes was purged prior to sampling.
- Submersible 12V pump at the seepage monitoring bores TMB04 and TMB05 which are screened within material of very low permeability. The physical parameters of the purged groundwater were initially tested, then the bores were purged dry and if any inflow was observed within 12 hours then physical parameters were tested again and a sample taken for analysis.
- Disposable bailer at the shallow perched soil water piezometers (with piezometers purged dry and if any inflow was observed within 12 hours then physical parameters were tested again and a sample taken for analysis).
- Micro-purge low-flow sample pump for groundwater monitoring bores S4MB01, TTMB02 and TCMB01 screened within material of relatively low permeability.
- Grab sample using a telescopic sampler for surface water and dam water samples.

EC and pH were monitored during purging to ensure that they had stabilised prior to sample collection. The water quality samples are analysed by an external NATA certified laboratory (ALS Environmental, Smithfield), in accordance with the EPA Approved Methods Publication "*Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales*" (EPA, 2004), with the exception of calcium, which underwent filtration rather than acid extraction as a preliminary treatment prior to analysis.

This report is prepared in accordance with the *Requirements for Publishing Pollution Monitoring Data* (EPA, 2012) (Publication Requirements).

The remaining water and land monitoring points in EPL 20358 will be reported in subsequent reports when the requirement for monitoring is triggered.

More information on the groundwater monitoring of the GGP is available on the project website: agl.com.au/Gloucester

Table 1: Water quality monitoring points: Irrigation Program (as per EPL 20358)

EPA ID no.	Monitoring Point	Type of monitoring point	Easting (m)	Northing (m)
27	TND	Produced water storage dam	Tiedman property	
28	TSD	Produced water storage dam	Tiedman property	
29	TED	Produced water storage dam	Tiedman property	
30	TMB04	Groundwater quality monitoring	402558.1	6448921.7
31	TMB05	Groundwater quality monitoring	402650.1	6448725.3
33	CDE	Surface water quality monitoring – catch dam east	Tiedman property	
34	CDW	Surface water quality monitoring – catch dam west	Tiedman property	
35	FSW01	Surface water quality monitoring	402001	6449646
36	ASW01	Surface water quality monitoring	401711.09	6449092.2
37	TSW01	Surface water quality monitoring	401993.98	6449416.7
38	TSW02	Surface water quality monitoring	401922.1	6448740.9
39	TMB01	Groundwater quality monitoring	401996.98	6449419.7
40	TMB02	Groundwater quality monitoring	401905.11	6449100.6
41	TMB03	Groundwater quality monitoring	401969.53	6448755
42	S4MB01	Groundwater quality monitoring	402581.88	6449409.7
43	TCMB01	Groundwater quality monitoring	402501.7	6448899
44	TTMB02	Groundwater quality monitoring	402699	6449358
45	SP1B	Soil water quality monitoring	402570.3	6449381.3
46	SP2B	Soil water quality monitoring	402444.2	6449100.1
47	SP4B	Soil water quality monitoring	402252	6449131.3
48	SP6B	Soil water quality monitoring	402103.5	6449178.6
49	SP7B	Soil water quality monitoring	402144.8	6449292.1
50	SP8B	Soil water quality monitoring	402159.1	6449454.8
51	SP9B	Soil water quality monitoring	402387.5	6449016.9
52	SP10B	Soil water quality monitoring	402344.2	6448840.6

Coordinate reference system: Map Grid of Australia 1994

Figure 1: Location of groundwater and surface water quality monitoring points: Irrigation Program (as per EPL 20358)

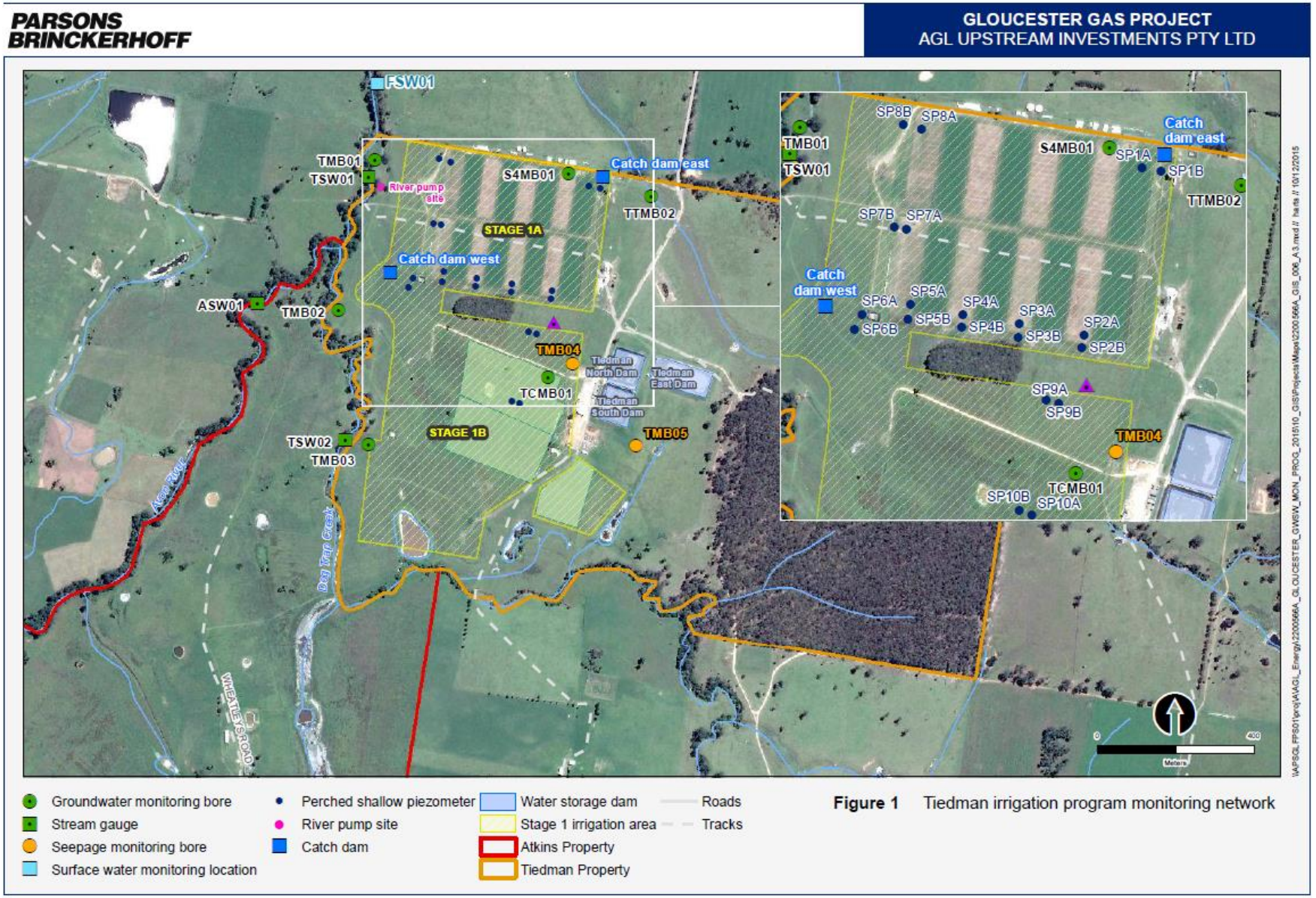

Table 2: Analytes monitored and frequency- monitoring points 27 – 52, as per the EPL 20358 version valid at the time of sampling (version 24 December 2015)

Analyte	Units of measure	Monitoring points															
		27		28		29		30,31		33,34		35, 36,37,38		39,40,41,42,43,44		45,46,47,48,49,50,51, 52	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Aluminium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Ammonia	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Benzene	micrograms per litre[a]					Weekly[b]	Grab sample	Special Frequency 1	Grab sample			Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Beryllium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Bicarbonate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample								
Boron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample								
Chromium	milligrams per litre									Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Copper	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Dissolved oxygen	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Electrical conductivity	microsiemens per centimetre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Special Frequency 8	Special method 5	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Ethyl benzene	micrograms per litre[a]					Weekly[b]	Grab sample*	Special Frequency 1	Grab sample			Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Iron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Mercury	milligrams per litre									Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Molybdenum	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nickel	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nitrate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nitrite	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample			Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
pH	pH	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Phosphorus (total)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Reactive Phosphorus	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample								
Redox potential	millivolts	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Selenium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Silica	milligrams per litre									Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Sodium Adsorption Ratio	sodium adsorption ratio			Quarterly	Special Method 4												
Standing water level	meters (Australian Height Datum)							Special frequency 8	Special method 5					Special frequency 8	Special method 5	Quarterly	Special method 1
Strontium (dissolved)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Sulfate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Toluene	micrograms per litre[a]					Weekly[b]	Grab sample*	Special Frequency 1	Grab sample			Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Total alkalinity	milligrams per litre									Each overflow event	Grab sample			Quarterly	Grab sample	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample								
Total suspended solids	milligrams per litre									Each overflow event	Grab sample	Quarterly	Grab sample				
Uranium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Vanadium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Xylene	micrograms per litre[a]					Weekly[b]	Grab sample	Special Frequency 1	Grab sample			Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Zinc	milligrams per litre							Special Frequency 1	Grab sample	Each overflow event	Grab sample	Special Frequency 10	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample

Notes:

Special Frequency 1 - Quarterly if inflow within 12 hours of purging dry.

Special Frequency 8 - Every 6 hours

Special Frequency 10 - Quarterly, and daily during any discharge from points 33 or 34

Special Method 1 - Manual dip

Special Method 4 - By calculation

Special Method 5 - Automated datalogger

Shaded grey - not required to be analysed

[a]EPL20358 (issued 24 December 2015) contains inconsistancies in the required Units of Measure for Benzene, Toluene, Ethyl Benzene and Xylene. For consistency with laboratory data BTEX concentrations are reported here in micrograms per litre.

[b]Weekly sampling from Monitoring Point 29 (Tiedman East Dam) only required if/when flowback water from the Waukivory Pilot Project is transferred to TED.

Groundwater and surface water monitoring results

Table 3: Water monitoring results for monitoring points 33 - 38 during the 23 January 2016 catch dam overflow event and February 2016 quarterly water sampling round

		Monitoring points	27	28	29	30	31	33	34	35	35	36	36	37	37	38	38	39
		Location	TND	TSD	TED	TMB04	TMB05	CDE	CDW	FSW01	FSW01	ASW01	ASW01	TSW01	TSW01	TSW02	TSW02	TMB01
		Sampled date	22/02/2016	22/02/2016	22/02/2016	23/02/2016	23/02/2016	23/01/2016	23/01/2016	23/1/2016 - unable to access sample location due to rainfall induced flooding	24/02/2016	23/1/2016 - unable to access sample location due to rainfall induced flooding	23/02/2016	23/1/2016 - unable to access sample location due to rainfall induced flooding	23/02/2016	23/1/2016 - unable to access sample location due to rainfall induced flooding	23/02/2016	23/02/2016
		Date AGL obtained data	3/03/2016	3/03/2016	3/03/2016	3/03/2016	3/03/2016	17/02/2016	17/02/2016	-	3/03/2016	-	3/03/2016	-	3/03/2016	-	3/03/2016	3/03/2016
		Monitoring event	B	B	B	B	B	A	A	A	B	A	B	A	B	A	B	B
Analyte	**Units of measure**	**Limit of reporting**																
Aluminium	mg/L	0.01	0.01	0.04	0.02	0.02	1.09	0.03	<0.01	na	0.02	na	0.02	na	0.02	na	0.11	<0.01
Ammonia	mg/L	0.01	0.01	0.01	<0.01	0.06	0.83	<0.01	0.02	na	0.02	na	0.02	na	0.02	na	0.06	0.38
Arsenic	mg/L	0.001	0.002	0.008	0.002	<0.001	<0.001	0.001	0.002	na	0.001	na	<0.001	na	<0.001	na	0.001	0.001
Barium	mg/L	0.001	0.163	0.103	0.094	0.063	0.095	0.176	0.207	na	0.043	na	0.040	na	0.044	na	0.042	0.212
Benzene	µg/L	1				<1	<1			na	<1	na	<1	na	<1	na	<1	<1
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	<0.001
Bicarbonate	mg/L	1	79	42	35	116	7											
Boron	mg/L	0.05	0.07	0.06	0.10	<0.05	<0.05	0.10	0.15	na	<0.05	na	<0.05	na	<0.05	na	<0.05	<0.05
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.0028	<0.0001	<0.0001	na	<0.0001	na	<0.0001	na	<0.0001	na	<0.0001	<0.0001
Calcium	mg/L	1	41	14	8	82	46	122	241	na	11	na	10	na	10	na	10	211
Chloride	mg/L	0.1	73.9	43.6	120	1910	2200											
Chromium	mg/L	0.001						<0.001	<0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	<0.001
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	0.092	0.296	<0.001	<0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	<0.001
Copper	mg/L	0.001	0.001	0.002	0.001	0.002	<0.001	0.003	0.004	na	0.001	na	<0.001	na	0.001	na	<0.001	<0.001
Dissolved oxygen[a]	mg/L	0.01	0.25	0.56	0.30	0.34	0.19	10.07	30.08	na	0.45	na	0.44	na	0.23	na	0.89	0.12
Electrical conductivity	µS/cm	1	786	473	852	7200	7340	758	1420	na	316	na	244	na	307	na	377	7550
Ethyl benzene	µg/L	2				<2	<2			na	<2	na	<2	na	<2	na	<2	<2
Iron	mg/L	0.05	<0.05	0.06	<0.05	1.7	5.82	0.06	<0.05	na	0.17	na	0.32	na	0.2	na	0.56	2.98
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	<0.001
Magnesium	mg/L	1	10	2	4	210	242	15	34	na	8	na	6	na	8	na	11	199
Manganese	mg/L	0.001	0.005	0.004	0.009	10.8	20.8	0.038	0.064	na	0.098	na	0.037	na	0.112	na	0.207	0.98
Mercury	mg/L	0.0001						<0.0001	<0.0001	na	<0.0001	na	<0.0001	na	<0.0001	na	<0.0001	<0.0001
Molybdenum	mg/L	0.001	0.002	0.006	0.004	<0.001	<0.001	<0.001	0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	<0.001
Nickel	mg/L	0.001	<0.001	0.006	<0.001	0.043	0.148	0.001	0.001	na	<0.001	na	<0.001	na	0.001	na	<0.001	<0.001
Nitrate	mg/L	0.01	<0.01	<0.01	<0.01	0.06	0.19	0.30	0.46	na	0.03	na	0.04	na	0.04	na	0.04	<0.01
Nitrite	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01			na	<0.01	na	<0.01	na	<0.01	na	<0.01	<0.01
pH[a]	pH	0.01	9.35	9.65	10.07	5.79	5.2	7.95	7.58	na	7.22	na	7.34	na	7.69	na	7.23	6.46
Phosphorus (total)	mg/L	0.01	0.42	0.39	0.24	0.06	0.01	0.58	0.85	na	0.07	na	0.02	na	0.05	na	0.12	0.04
Potassium	mg/L	1	38	31	38	19	16	16	27	na	3	na	2	na	3	na	3	2
Reactive Phosphorus	mg/L	0.01	0.21	0.01	<0.01	<0.01	<0.01											
Redox potential[a]	mV	0.1	200.2	178.5	82.7	431.4	470.9	184.6	181.5	na	435.5	na	237.9	na	201.9	na	282.9	285.4
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	<0.01	na	<0.01	na	<0.01	na	<0.01	<0.01
Silica	mg/L	0.05						7.33	15.6	na	17.5	na	18.6	na	17.5	na	14.9	36.6
Sodium	mg/L	1	88	66	140	1040	999	13	38	na	36	na	26	na	35	na	48	1070
Sodium Adsorption Ratio	ratio	0.01		4.37														
Standing water level	m AHD	-				Refer to Table 5	Refer to Table 5											Refer to Table 5
Strontium (dissolved)	mg/L	0.001	0.339	0.191	0.149	0.774	0.672	0.624	1.26	na	0.144	na	0.126	na	0.14	na	0.143	5.05
Sulfate	mg/L	1	135	37	9	585	209	322	685	na	11	na	6	na	13	na	19	76
Toluene	µg/L	2				<2	<2			na	<2	na	<2	na	<2	na	<2	<2
Total alkalinity	mg/L	1						36	64									529
Total dissolved solids	mg/L	10	479	272	466	4710	4760	582	1090	na	275	na	294	na	226	na	264	4990
Total organic carbon	mg/L	1	27	37	37	4	4											
Total suspended solids	mg/L	5						6	<5		<5		9		8		<5	
Uranium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	<0.001	na	<0.001	na	<0.001	na	<0.001	0.002
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	<0.01	na	<0.01	na	<0.01	na	<0.01	<0.01
Xylene	µg/L	2				<2	<2			na	<2	na	<2	na	<2	na	<2	<2
Zinc	mg/L	0.005				0.244	1.22	0.018	0.017	na	0.009	na	<0.005	na	0.008	na	<0.005	<0.005

Key:

Shaded grey = not required to be analysed

[a] measured with calibrated field meter

[*] limit of reporting raised due to matrix interferences

na - not analysed as no sample collected

Monitoring event:

A - 23 January 2016 overflow event

B - February 2016 quarterly water sampling round

Groundwater and surface water monitoring results

Table 4: February 2015 water monitoring results for monitoring points 40 – 52

		Monitoring points	40	41	42	43	44	45	46	47	48	49	50	51	52
		Location	TMB02	TMB03	S4MB01	TCMB01	TTMB02	SP1B[b]	SP2B[b]	SP4B[b]	SP6B	SP7B[b]	SP8B[b]	SP9B[b]	SP10B[b]
		Sampled date	23/02/2016	23/02/2016	23/02/2016	23/02/2016	23/02/2016	22/02/2016	22/02/2016	22/02/2016	22/02/2016	22/02/2016	22/02/2016	22/02/2016	22/02/2016
		Date AGL obtained data	3/03/2016	3/03/2016	3/03/2016	3/03/2016	3/03/2016	na	na	na	3/03/2016	na	na	na	na
		Monitoring event	B	B	B	B	B	B	B	B	B	B	B	B	B
Analyte	**Units of measure**	**Limit of reporting**													
Aluminium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	<0.01	na	na	na	na
Ammonia	mg/L	0.01	0.31	0.12	1.73	1.1	0.51	na	na	na	0.02	na	na	na	na
Arsenic	mg/L	0.001	0.004	0.002	<0.001	<0.001	<0.001	na	na	na	0.002	na	na	na	na
Barium	mg/L	0.001	0.91	0.207	7.01	9.17	0.71	na	na	na	0.043	na	na	na	na
Benzene	µg/L	1	<1	<1	<1	<1	<1	na	na	na	<1	na	na	na	na
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	<0.001	na	na	na	na
Bicarbonate	mg/L	1													
Boron	mg/L	0.05	<0.05	<0.05	0.15	<0.05	<0.05	na	na	na	<0.05	na	na	na	na
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	na	na	na	<0.0001	na	na	na	na
Calcium	mg/L	1	156	182	345	246	183	na	na	na	15	na	na	na	na
Chloride	mg/L	0.1													
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	0.001	na	na	na	na
Cobalt	mg/L	0.001	0.001	0.005	<0.001	<0.001	<0.001	na	na	na	0.003	na	na	na	na
Copper	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	0.003	na	na	na	na
Dissolved oxygen[a]	mg/L	0.01	0.100	0.180	0.180	0.620	0.110	na	na	na	0.700	na	na	na	na
Electrical conductivity	µS/cm	1	3830	5810	4840	3060	2460	na	na	na	5500	na	na	na	na
Ethyl benzene	µg/L	2	<2	<2	<2	<2	<2	na	na	na	<2	na	na	na	na
Iron	mg/L	0.05	7.45	1.43	1.26	2.19	2.63	na	na	na	0.1	na	na	na	na
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	<0.001	na	na	na	na
Magnesium	mg/L	1	84	130	56	66	48	na	na	na	69	na	na	na	na
Manganese	mg/L	0.001	1.16	1.84	0.186	0.045	0.101	na	na	na	0.23	na	na	na	na
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	na	na	na	<0.0001	na	na	na	na
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	na	na	na	0.045	na	na	na	na
Nickel	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	na	na	na	0.277	na	na	na	na
Nitrate	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	0.64	na	na	na	na
Nitrite	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	<0.01	na	na	na	na
pH[a]	pH	0.01	6.26	6.52	7.17	7.02	6.58	na	na	na	8.23	na	na	na	na
Phosphorus (total)	mg/L	0.01	0.04	<0.01	0.04	<0.01	0.2	na	na	na	0.12	na	na	na	na
Potassium	mg/L	1	3	2	6	4	3	na	na	na	1	na	na	na	na
Reactive Phosphorus	mg/L	0.01													
Redox potential[a]	mV	0.1	251.60	367.20	168.80	290.40	227.20	na	na	na	293.90	na	na	na	na
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	<0.01	na	na	na	na
Silica	mg/L	0.05	35	31.7	26.2	20.4	34.3	na	na	na	23.6	na	na	na	na
Sodium	mg/L	1	452	838	636	283	250	na	na	na	842	na	na	na	na
Sodium Adsorption Ratio	ratio	0.01													
Standing water level	m AHD	-	Refer to Table 5	Refer to Table 5	Refer to Table 5	Refer to Table 5	Refer to Table 5	na	na	na	1.09	na	na	na	na
Strontium (dissolved)	mg/L	0.001	3.25	4.03	26.4	14.8	2.98	na	na	na	0.676	na	na	na	na
Sulfate	mg/L	1	26	204	20	<1	60	na	na	na	261	na	na	na	na
Toluene	µg/L	2	<2	<2	<2	<2	<2	na	na	na	<2	na	na	na	na
Total alkalinity	mg/L	1	181	538	492	310	386	na	na	na	109	na	na	na	na
Total dissolved solids	mg/L	10	2590	3550	3410	2380	1700	na	na	na	3420	na	na	na	na
Total organic carbon	mg/L	1													
Total suspended solids	mg/L	5													
Uranium	mg/L	0.001	<0.001	0.011	<0.001	<0.001	<0.001	na	na	na	<0.001	na	na	na	na
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	<0.01	na	na	na	na
Xylene	µg/L	2	<2	<2	<2	<2	<2	na	na	na	<2	na	na	na	na
Zinc	mg/L	0.005	0.007	0.011	0.015	0.027	0.023	na	na	na	0.021	na	na	na	na

Shaded grey = not required to be analysed

[a] measured with calibrated field meter

[b] No water present at this location at the time of sampling

na - not analysed as no sample collected

Monitoring event:

B - February 2016 quarterly water sampling round

Table 5: Continuous electrical conductivity monitoring results for monitoring points 30, 31, 33, 34, 39 - 44 for the period 6 January 2016 – 24 February 2016

Monitoring point	33	34	30	31	39	40	41	42	43	44
Location	CDE*	CDW	TMB04	TMB05	TMB01	TMB02	TMB03	S4MB01	TCMB01	TTMB02
Data type	Electrical conductivity		Standing water level							
Units	µS/cm		mAHD							
Data date range	17/11/2016 – 22/2/2016	6/1/2016 – 22/2/2016	16/11/2015 – 22/2/2016		17/11/2015 – 23/2/2016			19/11/2015-23/2/2016		
Date data downloaded	22/02/2016	22/02/2016	22/02/2016	22/02/2016	23/02/016	23/02/016	23/02/016	23/02/2016	23/02/2016	23/02/2016
Date data supplied to AGL	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016	01/03/2016
Monitoring frequency required by EPL 20358	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours
Actual monitoring frequency	Every 1 hour	Every 1 hour	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours
No. of times measured during monitoring period	1822	2344	395	395	395	395	394	387	386	386
Min. value	32	32	111.7	110.7	102.8	102.8	103.6	112.0	113.8	113.9
Mean value	393	379	113.3	113.2	103.2	103.1	103.9	113.0	113.8	114.0
Median value	533	295	113.3	113.3	103.1	103.0	103.8	113.0	113.8	114.0
Max. value	972	853	113.3	113.4	104.6	103.8	104.3	113.1	113.9	114.1

*Data logger did not function between 14/12/2015 and 6/1/2016; no continuous data was collected during these dates.

References

AGL, 2012a. Water Management Plan for the Tiedman Irrigation Program AGL. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/AGL%20WMP%20Tiedman%20Irrigation%20V1%203%20140512%20Final%20Compiled%20LowRes.pdf

AGL, 2012b. Soil Quality Monitoring and Management Program. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/Gloucester%20Soil%20Management.pdf

Environment Protection Authority (EPA), 2004. Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales, The Department of Environment and Conservation, Sydney, Australia. Available online: http://www.environment.nsw.gov.au/resources/water/approvedmethods-water.pdf

Parsons Brinckerhoff (PB) 2012. Phase 2 Groundwater Investigations – Stage 1 Gas Field Development Area, Gloucester Gas Project. Report dated January 2012, PR_5630. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Assessments%20and%20Reports/2012/January/PB%20Gloucester%20Groundwater%20Report%20Phase%202%20Appendices%20E-P.pdf

Parsons Brinckerhoff (PB) 2013a. Gloucester Gas Project – Tiedman Irrigation Trial Baseline Water Monitoring Program. Report dated January 2013, 2162406D PR_6306. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/Gloucester%20Irrigation_PR.pdf

Parsons Brinckerhoff (PB) 2013b. Tiedman Irrigation Trial – August 2013 Water Compliance Report, Gloucester Gas Project. Report dated August 2013, 2162406F-WAT-RTP-7408 RevC. http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20Community%20News/Gloucester/Community%20Updates/2013/September/2162406F%20WAT%20RPT%207408%20FINAL_LowRes.pdf

Parsons Brinckerhoff (PB) 2014a. Tiedman Irrigation Program – Water Compliance Report for the Period 1 July to 31 December 2013, Gloucester Gas Project. Report dated January 2014, 2162406F-WAT-RPT-7674 RevB. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Assessments%20and%20Reports/2014/20140131_Teidman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.pdf

Parsons Brinckerhoff (PB) 2014b. Tiedman Irrigation Program – Water Compliance Report for the Period 1 January to 4 July 2014, Gloucester Gas Project. Report dated August 2014, 2162406F-WAT-RPT-7674 001 RevD. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Irrigation%20Program/20140828_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.pdf

Parsons Brinckerhoff (PB) 2015a. Tiedman Irrigation Program – Water Compliance Report for the Period 1 January to 3- June 2015, Gloucester Gas Project. Report dated 13 August 2015, 2268517A-WAT-RPT-001 Rev C. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Irrigation%20Program/20150226_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.pdf

Parsons Brinckerhoff (PB) 2015b. Tiedman Irrigation Program – Water Compliance Report for the Period 5 July – 31 December 2014, Gloucester Gas Project. Report dated February 2015, 2268517B-WAT-RPT-001 Rev D. Available online: http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Irrigation%20Program/20150813_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report%20for%20the%20Period%201%20Jan%20to%2030%20June%202015.pdf

The State of NSW and Environment Protection Authority (EPA), 2012. Requirements for publishing pollution monitoring data. Environment Protection Authority, Sydney, Australia. Available online: http://www.epa.nsw.gov.au/resources/licensing/130742reqpubpmdata.pdf