Department of Environment and Resource Management

Notice of annual return

Environmental Protection Act 1994

This notice is issued by the Department of Environment and Resource Management pursuant to Section 316 of the Environmental Protection Act 1994 to inform of a statutory requirement.

CH4 Pty Limited
PO Box 5262
BRISBANE QLD 4000

Our reference: 315517

Dear Sir / Madam

Re: Annual Fee and Return

Permit[1] Number	Permit[1] Type	Activity	Location
PEN100015907	Level 1 Environmental Authority	Petroleum – High or significant hazard dam – Level 1	PL191 PL196

The anniversary date of the Environmental Authority is 01-Oct. The fee period covered by this notice is 01-Oct-10 to 30-Sept-11. The annual fee for the above permit is now due and payable.

In order to maintain your permit you must:

- pay the annual fee of $33,990.00.

  (These fees are included in the Federal Treasurer's Determination under Division 81 of A New Tax System [Goods and Services Tax] Act 1999. As such, the supplies are exempt from GST and there is no requirement to issue a Tax Invoice); and
- complete and return the attached 'Annual Return' form by 01-Oct-10.

Please forward the annual fee and the completed 'Annual Return' form to Permit and Licence Management at the address shown below by 01-Oct-10. Failure to pay the annual fee in full, by the due date, will result in:

- a late fee of $103.00 being payable; and may result in
- suspension or cancellation of the permit.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management.

Queensland Government

Department of Environment and Resource Management
www.derm.qld.gov.au ABN 46 640 294 485

Department of Environment and Resource Management

Notice of annual return

If you require more information, please contact Hailey Van Kruining from Petroleum and Gas on 3330 5349.

Yours sincerely

sch4p4(1)(c) Personal information

Delegate
Environmental Protection Act 1994

31-Aug-10

Enquiries:

Permit and Licence Management
Department of Environment and Resource Management
GPO Box 2454
BRISBANE QLD 4001
Phone: 1300 130 372
Fax: 07 3896 3342
E-mail: palm@derm.qld.gov.au

Attachment – 'Annual Return' form

arrow energy
go further

1 October 2010

Ref: ENV10-212

Permit and Licence Management
Department of Environment and Resource Management
GPO Box 2454, BRISBANE QLD 4001

RE: PEN100015907 Annual Return for PL191, PL196, PPL115 and PPL116.

In response to the notice of annual return relating to PEN100015907, Arrow Energy Ltd[1] submits the following documents:

- Completed annual return for an environmental authority for a level 1 petroleum activity
- Copy of DERM notice of annual return, dated 31 August 2010
- Copy of environmental authority PEN100015907, dated 12 January 2010[2]
- Annual return fee payment details ($33,990.00)
- Annual Return Reporting Information (Ref: ENV10-209)

Please contact me on s.73 - Non responsive information or email s.73 - Non responsive information if you require any further information.

Kind regards

s.73

SENIOR ENVIRONMENT COORDINATOR

[1] On behalf of Principal Holder and Joint Holders
[2] The EA that was current for the majority of the reporting period

ecoaccess
environmental licences and permits

Annual return

Section 316 — *Environmental Protection Act 1994*

For an environmental authority for a level 1 petroleum activity

OFFICIAL USE ONLY

DATE RECEIVED:

FILE REF:

PROJECT REF:

COMPLETE FORM ☐ CORRECT AA ☐

COMPLETE FEE ☐

ADMINISTERING DISTRICT:

ENTERED BY [SIGNATURE]:

DATE:

GUIDE

Identify the holder(s) of the existing EA. Where there are joint holders, list each. Provide full legal names.

Important information for applicants

This form must be completed annually by the holders of all environmental authorities (EAs) that contain a level 1 petroleum activity under section 316 of the *Environmental Protection Act 1994* (EP Act).

Each holder of an EA for a level 1 petroleum activity should receive from the Environmental Protection Agency (EPA), prior to the anniversary day of the EA, an annual notice requiring the submission of an annual return and annual fee on or before the anniversary day for the EA.

The anniversary day is the day the authority was issued. The guidance information provided on the left side of this document is intended to assist you to complete the form.

Please forward the return to: Ecoaccess Customer Service Unit (ESCU), Environmental Protection Agency, PO Box 15155, City East Qld 4002.

Annual return details

1. Environmental authority (EA) holder name(s)

NAME(S):
CH4 Pty Ltd
AGL Energy Ltd
Shell CSG (ATP364) Pty Ltd

2. Petroleum EA number

EA NUMBER:
PEN100015907 (dated 12 Jan 2010) (NB: This was the EA that was current for the majority of the reporting year -1 Oct 2009 and 30 Sep 2010)

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

Queensland Government
Environmental Protection Agency

3. Principal holder (where applicable)

Where there is more than one holder, all joint holders may appoint one holder as the principal holder to act on behalf of them all. The appointment must be made when applying for the authority or by use of the EPA form 'appointment or cancellation of appointment of principal holder'.

NAME OR NAME OF COMPANY AND CONTACT PERSON:	
CH4 Pty Ltd	
REGISTERED BUSINESS ADDRESS: L19, 42-60 Albert Street Brisbane QLD 4000	
FULL POSTAL ADDRESS (WHERE DIFFERENT): GPO Box 5262 Brisbane QLD 4001	
TELEPHONE: s.73 -Non responsive inform	FACSIMILE: s.73, s.73 - Non responsive
MOBILE TELEPHONE: s.73 -Non responsive ir	E-MAIL: s.73 -Non responsive information

4. Contact Person

Statutory documents will be sent to the EA holder and the contact person.

NAME: s.73 -Non responsive infor	
POSITION AND COMPANY: Arrow Energy Limited Environment Manager	
FULL POSTAL ADDRESS: GPO Box 5262 Brisbane QLD 4001	
TELEPHONE: s.73 -Non responsive infor	FACSIMILE: s.73 -Non responsive infor
MOBILE TELEPHONE: s.73 -Non responsive ir	E-MAIL: s.73 -Non responsive information

5. Does a condition of your EA require you to prepare an annual report?

Please do not submit an annual report, required by a condition of an EA, with this annual return. Annual reports are to be stored in a safe location for viewing by officers of the EPA upon request.

☒ Yes → Please do not submit an annual report with this annual return. Provide in the box below information on how we may access the report, if needed.

The EA requires the annual report to be lodged with the annual return and as such has been attached. The reference number for the annual report is ENV10-209.

☐ No

Questions 6 & 7:

Section 320 of the EP Act imposes a duty to report serious or material environmental harm caused or threatened in the carrying out of your activity unless authorised under the EA.

Section 350 of the EP Act allows a person who has caused environmental harm to give notice to the EPA of the occurrence and declare an intention to prepare a transitional environmental program to deal with the matter. The giving of a program notice allows relevant documents or information attached to the program notice to be not admissible in evidence.

6. Since the date of your last return (or the date of issue in the case of a new EA) have you fully complied with the conditions of your EA?

☒ Yes → go to Question 8

☐ No

7. For each condition of your EA with which you have not complied, please attach the following:

a) a statement of whether or not you have previously reported the non-compliance incident;

b) a description of the non-compliance incident;

c) a description of impacts resulting from the non-compliance incident; and

d) a description of remedial activities undertaken.

Tick to indicate attachments ☐

Questions 8 & 9:

Refer to Appendix A for an abridged list of all ERAs and their associated annual fees. The highest relevant annual fee is required to be submitted with this annual return.

The fees associated with this form have been excluded from GST by the Commonwealth Government.

8. List all the level 1 environmentally relevant activities (ERAs) authorised as part of your EA

ERA NUMBER(S):
Schedule 5 No 6 and Schedule 5 No 8

ERA 8 (3)(a) - Chemical Storage
ERA 9 (c) - Hydrocarbon gas refining
ERA 15 - Fuel burning (500kg/hr or more)
ERA 60 (1)(d) - Waste disposal
ERA 63 (2)(b) - Sewage treatment

9. Identify, from the list in Question 8, the ERA with the highest annual fee - this is the fee due

ERA NUMBER:	FEE DUE:
Schedule 5 No 6	$ 33 990.00

Have you attached the fee due?

☒ Yes

☐ No

Further notes for Table 1:

- Where financial years are the basis of your plan, financial years are to be stated in Table 1. Otherwise, state the period your plan is based on (e.g. Jan 2000 to Jan 2001).

10. Summary of disturbance and rehabilitation (see Table 1 below)

Compare areas of actual disturbance and rehabilitation (during the previous 12 month period) with those areas nominated in the relevant transitional environmental plan by completing Table 1 below.

[1] Total project disturbance – is the sum of all areas disturbed during the life of a project, including those areas that have been successfully rehabilitated. Areas disturbed are defined as those areas on which the land surface has been altered by activities associated with the project (e.g. vegetation and topsoil removed).

[2] Area remaining disturbed – is calculated by subtracting areas that have been successfully rehabilitated from the sum of all areas disturbed during the life of the project.

[3] 'Plan' and 'Planned' – are references to the relevant transitional environmental plan.

Table 1: Summary of disturbance and rehabilitation

Total Areas	A. **Prior to commencement of current Plan** [3] **(Actual)**	B. **Previous year** 01/10/08 to 30/09/09		C. **Current year** 01/10/09 to 30/09/10	
		B1 **Planned** [3]	B2 **Actual**	C1 **Planned** [3]	C2 **Actual**
(i) **Total project disturbance** [1] **to the end of the period** (ha)	262	181	181	218	218
(ii) **Area rehabilitated using agreed method** (ha)	81	67	67	10	10
(iii) **Area remaining disturbed**[2] **at end of period** (ha)	181	114	114	208	208

11. For any areas of rehabilitation that have been unsuccessful:

a) provide details;

b) outline measures that have been undertaken in the previous 12 month period to comply with rehabilitation requirements; and

c) propose future methods including timeframes to achieve success.

Tick to indicate attachments ☐

12. EPA office

Please indicate the EPA region in which the activity is located (see the information sheet *EPA's Environmental Services' offices — contact details and Council areas*[1] to determine what the relevant regional office is).

	Regional office	Office use only Account code
☐	Brisbane North	9091210/431081
☐	Brisbane North (Sunshine Coast)	9090415/431081
☐	Brisbane South	9090411/431081
☐	Central Coast (Gladstone)	9090220/431081
☐	Central Coast (Rockhampton)	9090221/431081
☐	Far Northern (Cairns)	9090236/431081
☐	Far Northern (Mount Isa)	9090240/431081

	Regional office	Office use only Account code
☐	Ipswich	9091085/431081
☐	Townsville	9090249/431081
☐	Western (Toowoomba)	9090422/431081
☐	Whitsunday Coalfields (Emerald)	9090218/431081
☒	Whitsunday Coalfields (Mackay)	9090222/431081
☐	Wide Bay (Maryborough)	9090416/431081

13. Payment

The applicable fee[2] of $ 33,990.00

☐ is enclosed with this application (cheque, money order etc.); or

☒ was paid by electronic funds transfer (EFT) on _____ ; and

details required in the information sheet *Electronically paying fees to the EPA* were included.

The payment was for:

☐ this application only and the EFT identification code is: _____ / / _____ ; or

☐ this and other applications. A payment notification (from the final page of the information sheet *Electronically paying fees to the EPA*[1]) was sent to the EPA and a copy is attached.

Note: Failure to pay the annual fee or, where fees are paid by EFT, to include sufficient detail to show that the fe has been paid may result in the Environmental Protection Agency taking action under the legislation for failure to comply with the annual notice. This may lead to suspension or cancellation of the environmental authority.

[1] Available at www.epa.qld.gov.au or through the Ecoaccess Customer Service Unit (phone 1300 368 326).
[2] See the information sheet *Summary of fees — environmentally relevant activities (ERAs)*, available at www.epa.qld.gov.au or through the Ecoaccess Customer Service Unit (phone 1300 368 326).

Please read carefully through the declaration before signing.

You may apply for exemption from disclosing information contained in a document submitted, or proposed to be submitted with this annual return (see section 564 of the EP Act), but please note that this may not prevent information from being disclosed.

Please be aware that under section 480 of the EP Act, it is an offence to give the administering authority information that is false, misleading or incomplete in any material particular. The maximum penalty for such action is 165 penalty units for an individual, or 825 penalty units where the applicant is a corporation (section 181B(3) of *the Penalties and Sentences Act 1992*).

Thank you for the time you have spent completing this form. Please forward your completed annual return and all attached information to the Ecoaccess Customer Service Unit (details below).

14. Declaration

- I / We, being the holders identified at Question 1, acknowledge that all information supplied on or with this annual return may be made available upon request, subject to the provisions of the *Freedom of Information Act 1992* and/or by EPA administrative access arrangements.

I, s.73 - Non responsive infor
Printed name of person signing this form

- am the holder or the appointed signatory, authorised to sign on behalf of the environmental authority holder(s), and commit this person/entity in all matters relevant to this annual return. I am aware that under section 480 of the *Environmental Protection Act 1994*, it is an offence to give the administering authority information that I know is false, misleading or incomplete in any material particular. The maximum penalty for such action is 165 penalty units for an individual, or 825 penalty units where the applicant is a corporation (section 181B (3) of the *Penalties and Sentences Act 1992*).

SIGNATURE: s.73	
POSITION OF SIGNATORY (IE DIRECTOR, MANAGER, OWNER, CEO ETC): ENVIRONMENT MANAGER ARROW ENERGY LTD	DATE: 1/10/10

15. Annual return checklist

- ☒ Annual return completed and signed
- ☒ Annual fee paid or enclosed (if applicable)
- ☒ Account code selected from section 12 for the EPA region in which the activity operates
- ☒ Supporting information or accreditation attached (if applicable)

Please return your completed annual return to:

Ecoaccess Customer Service Unit
Environmental Protection Agency
PO Box 15155
City East
Queensland 4002.
Enquiries: 1300 368 326
Facsimile: (07) 3115 9600
E-mail: eco.access@epa.qld.gov.au

Appendix A - Abridged list of environmentally relevant activities (ERAs) that are possibly relevant to petroleum operations

The table below outlines the numbers, names, levels and annual fees for a selection of ERAs that are possibly relevant to petroleum operations. For the complete list, see Schedule 1 of *the Environmental Protection and Regulation 1998* or the EPA web site: www.epa.qld.gov.gov.au. Please note that all fees listed are subject to change. The associated fees have been **excluded from GST** by the Commonwealth Government.

Key :

L = Level of Environmentally Relevant Activity

ENVIRONMENTALLY RELEVANT ACTIVITY (INCLUDING THRESHOLDS)	L	Annual Fees($)
Chemical, coal and petroleum products activities		
6. Chemical manufacturing, processing or mixing—manufacturing or processing an inorganic chemical, organic chemical or chemical product, or mixing inorganic chemicals, organic chemicals or chemical products (other than mixing non-combustible or non-flammable chemicals or chemical products by dilution with water), in a plant or works having a design production capacity of—		
(a) 200 t or more but less than 20 000 t per year	1	4420
(b) 20 000 t or more but less than 100 000 t per year	1	5200
(c) 100 000 or more tonnes per year	1	5820
7. Chemical storage—storing chemicals (other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of—		
(a) more than 10 m^3 but less than 1 000 m^3	2	-
(b) 1 000 m^3 or more	1	1740
9. Gas producing—commercially producing hydrocarbon gas by any method, including the reforming of hydrocarbon gas, but not including collecting hydrocarbon gas in carrying out an activity under item 15 or 75.	1	4420
11. Crude oil or petroleum product storing—storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of—		
(a) 10 000 l or more but less than 500 000 l	2	-
(b) 500 000 l or more	1	1740
12. Oil refining or processing—refining or processing crude oil or shale oil in works having a design production capacity of—		
(a) less than 500 000 l per year	1	2054
(b) 500 000 l or more, but less than 150 000 000 l, per year	1	5200
(c) 150 000 000 l or more per year	1	20,540
13. Fuel gas refining or processing—refining or processing of fuel gas in works having a design production capacity at standard temperature and pressure of—		
(a) less than 200 000 000 cubic metres per year	2	-
(b) 200 000 000 cubic metres or more per year	1	20,540
Electricity, fuel burning and water supply activities		
17. Fuel burning—any process involving the use of fuel burning equipment (including, for example, a standby power generator) that is capable of burning (whether alone or in total) 500 kg or more of fuel per hour.	1	3000
18. Power station—generating power by consuming fuel at a rated capacity of 10 MW electrical or more—		
(a) if the fuel used is natural gas	1	4420
(b) for any other fuel	1	14,940
Extractive activities and petroleum		
21C. The construction of a new transmission pipeline under a pipeline licence issued under any of the petroleum legislation.	1	3390
21D. A petroleum activity otherwise prescribed under this schedule as a level 1 environmentally relevant activity.	1	The amount provided under schedule 6, part 1A, item 9A.
21E. A petroleum activity not otherwise prescribed under this schedule as a level 1 environmentally relevant activity.	2	Nil

ENVIRONMENTALLY RELEVANT ACTIVITY (INCLUDING THRESHOLDS)	L	Annual Fees($)
Fabricated metal product activities		
28. Motor vehicle workshop—operating a workshop or mobile workshop in the course of which motor vehicle mechanical or panel repairs are carried out in the course of a commercial or municipal enterprise (other than on a farm or under a mining tenement) or on a commercial basis.	1	500
Transport and maritime services	2	nil
70. Heliport—operating a facility for landing helicopters (other than a facility forming part of an aerodrome used for general aviation or for sole use in emergency circumstances)		
Waste management		
75. Waste disposal—operating a facility for—		
(a) disposing of only general waste or limited regulated waste, if the facility is designed to receive waste at the rate of—	1	500
(i) more than 50 t but not more than 2 000 t per year	1	750
(ii) 2 000 t or more, but less than 5 000 t, per year	1	1000
(iii) 5 000 t or more, but less than 10 000 t, per year	1	1500
(iv) 10 000 t or more, but less than 20 000 t, per year	1	2000
(v) 20 000 t or more, but less than 50 000 t, per year	1	2500
(vi) 50 000 t or more, but less than 75 000 t, per year	1	5000
(vii) 75 000 t or more, but less than 100 000 t, per year	1	7500
(viii) 100 000 t or more, but less than 200 000 t, per year	1	10,000
(ix) 200 000 t or more per year		
(b) disposing of regulated waste (other than limited regulated waste) whether alone or in combination with any waste mentioned in paragraph (a), if the facility is designed to receive waste at the rate of—	1	3000
(i) less than 50 000 t per year	1	5220
(ii) 50 000 t or more, but less than 100 000 t, per year	1	7500
(iii) 100 000 t or more, but less than 200 000 t, per year	1	10,000
(iv) 200 000 t or more per year		
76. Incinerating waste—operating a waste incineration facility for incinerating—		
(a) vegetation	2	-
(b) clean paper or cardboard	2	-
(c) general waste (other than vegetation or clean paper or cardboard) whether alone or in combination with vegetation or clean paper or cardboard, designed to incinerate waste at the rate of—		
(i) not more than 5 000 tonnes per year	1	2280
(ii) 5 000 tonnes or more per year	1	5000
(d) infectious substances or quarantine waste	1	4750
(e) regulated waste (other than waste mentioned in paragraph (d))	1	6000
78. Chemical or oil recycling—operating a facility for receiving and commercially recycling or reprocessing used chemicals, oils or solvents to produce saleable products	1	3820
79. Drum reconditioning—operating a facility for receiving and commercially reconditioning metal or plastic drums	2	-
81. Recycling or reprocessing regulated waste—operating a facility for receiving and recycling or reprocessing regulated waste (other than waste recycled or reprocessed under item 32(a), 46, 47, 50, 53 or 77 to 80) to produce saleable products.	1	2280
83. Regulated waste transport—transporting regulated waste commercially or in quantities of more than 250 kg in a load—		
(a) for tyres	2	-
(b) for other regulated waste—		
(i) for 1 or more licensed vehicles but not more than 35 licensed vehicles	1	400 (plus 100 for each vehicle)
(ii) for 36 or more licensed vehicles	1	4000
(EXEMPT FROM IDAS)		
84. Regulated waste storage—operating a facility for receiving and storing—		
(a) more than 500 tyres in whole or equivalent parts (other than tyres stored for recycling or reprocessing under item 80)	1	1400
(b) other regulated waste, other than waste stored—	1	2000
(i) on a farm for use as a soil conditioner or fertiliser in carrying out an agricultural activity; or		
(ii) for use in manufacturing a saleable product under another item of this schedule; or		
(iii) for incineration under item 76; or		
(iv) recycling, reprocessing or reconditioning under items 77 to 79 or 81		
85. Regulated waste treatment—operating a facility for receiving and treating regulated waste to render it less or non-hazardous, other than by—		
(a) manufacturing a saleable product under another item of this schedule; or	1	4750
(b) incineration under item 76; or		
(c) recycling, reprocessing or reconditioning under items 77 to 79 or 81		

ENVIRONMENTAL PROTECTION ACT 1994

Queensland Government

Department of Environment and Resource Management
Petroleum and Gas Unit
PO Box 15155
CITY EAST QLD 4002

Environmental Authority (petroleum activities) Permit Number: PEN100015907

Section 312D *Environmental Protection Act 1994*

This environmental authority is granted under the Environmental Protection Act 1994 and includes conditions to minimise environmental harm caused, or likely to be caused, by the authorised petroleum activities. An environmental authority (petroleum activities) may be for petroleum activities authorised (under the Petroleum and Gas (Production and Safety) Act 2004, Petroleum Act 1923 or Petroleum (Submerged Lands) Act 1982) to occur under one or more of the following petroleum authorities: authority to prospect; petroleum lease, data acquisition authority, water monitoring authority, petroleum facility licence, survey licence, pipeline licence, licence, permit, primary licence, secondary licence or special prospecting authority. In general, a petroleum activity means an activity that is authorised under the relevant petroleum legislation. Rehabilitation and remediation activities that facilitate and support petroleum activities and any action taken to prevent environmental harm are included in the definition of petroleum activity.

Under the provisions of the *Environmental Protection Act 1994* this environmental authority is issued to:

Principal Holder

CH4 Pty Ltd
AM-60
Level 19
42 Albert Street
BRISBANE QLD 4000

Joint Holders

AGL Energy Limited
Level 22
101 Miller Street
NORTH SYDNEY NSW 2060

Shell CSG (ATP364) Pty Ltd
Level 2 LS
8 Redfern Road
HAWTHORN EAST, VIC 3123

in respect of carrying out a Level 1 Petroleum Activity under Section 23 and under Schedule 5A of the Environmental Protection Regulation 2008.

Activity	Description
Schedule 5, No.6	A petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam
Schedule 5, No. 8	A petroleum activity, other than a petroleum activity mentioned in items 1 to 7, that includes 1 or more chapter 4 activities for which an aggregate environmental score is stated: ERA 8 (3)(a) - Chemical storage – storing the following total quantity of chemicals of class C1 and C2 combustible liquids under AS1940or dangerous goods class 3 under subsection c) – 10m^3 to 500m^3 ERA 9 – Hydrocarbon gas refining of less than 200,000,000m^3 a year. ERA 15 – Fuel burning – using fuel burning equipment that is capable of burning at least 500kg of fuel per hour. ERA 60(1)(a)(i)1(d) - Waste disposal – operating a facility for disposing of, in a year, more than 200 000t of regulated waste.

on or in relation to the relevant petroleum authorities identified below:

Relevant Petroleum Authority	Project Name	Project Location Description
Petroleum Lease (PL) 191 **Petroleum Lease (PL) 196** **Petroleum Pipeline Licence (PPL) 115** **Petroleum Pipeline Licence (PPL) 116**	**Moranbah Gas Project**	**See Appendix C**

This environmental authority (petroleum activities) is subject to the conditions that the holder carry out the above environmentally relevant activities in accordance with the conditions listed in the attached schedules.

This environmental authority takes effect from **date of grant of the relevant petroleum authority.**

This environmental authority remains in force unless it is cancelled, surrendered or suspended.

The anniversary date of this environmental authority is **1 October.**

sch4d4(6) Re

Signed

12 JANUARY 2010
Date

Parma Nand
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This environmental authority document is not proof of the current status of the environmental authority. The current status of the environmental authority may be ascertained by contacting the administering authority.

Schedule of conditions

The aforementioned description of the ERA for which this authority is issued is simply a restatement of the activity in the legislation at the time of issuing of the authority. Where there is conflict between the above description of the ERA for which this authority is issued and the conditions as specified in this authority as to the scale, intensity or manner of carrying out of the ERA, then such conditions prevail to the extent of the inconsistency.

This licence incorporates the following schedules of conditions relevant to various issues:

Schedule A - General
Schedule B - Air
Schedule C - Water
Schedule D - Noise
Schedule E - Waste
Schedule F - Land
Schedule G - Regulated Dams
Schedule H - Community

Schedule A - General conditions

Financial Assurance

(A1-1) Provide a financial assurance in the amount and form required by the administering authority at the time of submission of the initial or subsequent new development plan for the relevant petroleum authorities.

NOTE: The calculation of financial assurance for condition (A1-1) must be in accordance with the guideline "Financial assurance for petroleum activities". The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for the financial assurance must be the highest total rehabilitation cost calculated for any year of the Environmental Management Plan.

(A1-2) The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

NOTE: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance may be applicable where rehabilitation has been completed in accordance with the acceptance criteria defined within this environmental authority.

Maintenance of Measures, Plant and Equipment

(A2-1) The holder of this authority must ensure:

(a) that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed;

(b) that such measures, plant and equipment are maintained in a proper condition; and

(c) that such measures, plant and equipment are operated in a proper manner.

Monitoring

(A3-1) Record, compile and keep for a minimum of five (5) years all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.

(A3-2) Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

(A3-3) A record must be maintained of at least the following events:

(a) the time, date and duration of equipment malfunctions where the failure of equipment resulted in the release of contaminants reasonably likely to cause environmental harm;

(b) any uncontrolled release of contaminants reasonably likely to cause environmental harm; and

(c) any emergency involving the release of contaminants reasonably likely to cause material or serious environmental harm requiring the use of fire fighting equipment.

Annual Monitoring Report

(A4) An annual monitoring report must be provided to the administering authority with the annual return. This report shall include but not be limited to:

(a) a summary of the previous twelve (12) months' monitoring results obtained under any monitoring programs required under this authority and, in graphical form showing relevant limits, a comparison of the previous twelve (12) month's monitoring results to both this authority limits and to relevant prior results;

(b) an evaluation/explanation of the data from any monitoring programs; and a summary of any record of quantities of releases required to be kept under this authority; and

(c) a summary of the record of equipment failures or events recorded for any site under this authority; and

(d) an outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs.

Environmental Management Plan

(A5-1) The holder of this authority must comply with an updated version of the Environmental Management Plan titled *Moranbah Environmental Management Guidelines & Procedures, April 2008*, and include any relevant matters associated with Pond 10. The updated EM Plan must comply with section 310D of the *Environmental Protection Act 1994* and must be submitted to the administering authority within 30 days after issuing of EA. To the extent of any inconsistency between the conditions of this authority and the relevant Environmental Management Plan, the conditions of this authority prevail.

Scope of Environmental Authority

(A6-1) This authority only permits the burning of diesel and gas fuel in fuel burning equipment.

(A6-2) Once the compressor station has been decommissioned a site investigation and remediation report shall be undertaken and submitted to the administering authority. If the report identifies that further remediation work is required, then that work shall be completed prior to any surrender of this authority.

Storage and Handling of Flammable and Combustible Liquids

(A7-1) Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with *Section 5.9 of AS 1940 - Storage and Handling of Flammable and Combustible Liquids of 2004.*

Development Plan

(A8-1) The holder of this authority must submit to the administering authority a copy of the initial and later development plans for the relevant petroleum authority.

Note: A later development plan is required only where the change in activities proposed under the plan will require a change in financial assurance. The plan is required 8 business days prior to the commencement of the varied activities covered by the plan.

Definitions

(A9-1) Words and phrases used throughout this authority are defined in *Definitions*. Where a definition for used in this authority is sought and the term is not defined within this authority, the definitions in the *Environmental Protection Act 1994*, its Regulations and Environmental Protection Policies must be used.

END OF CONDITIONS FOR SCHEDULE A

Schedule B – Air

Dust Nuisance

(B1-1) The release of dust or particulate matter or both resulting from the petroleum activity must not cause an environmental nuisance at any sensitive place or commercial place.

(B1-2) When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

(B1-3) If the holder of this authority can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of (B1-1):

a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with *AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991*; and

b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time, at a sensitive or commercial place downwind of the operational land, when monitored in accordance with:

i) Particulate matter - Determination of suspended particulate PM10 high-volume sampler with size-selective inlet - Gravimetric method, when monitored in accordance with *AS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM (sub) 10 high volume sampler with size-selective inlet - Gravimetric method of 1990*; or

ii) Any alternative method of sampling PM10, which may be permitted by the *Air Quality Sampling Manual* as published from time to time by the administering authority.

NOTE: You must propose which monitoring method is appropriate in accordance with condition (B1-3) (a) or (b) or both.

(B1-4) If monitoring indicates exceedence of the relevant limits in Condition (B1-3), then the environmental authority holder must:

(a) address the complaint including the use of appropriate dispute resolution if required; and

(b) immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

Odour Nuisance

(B2-1) The release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the petroleum activity must not cause an environmental nuisance at any sensitive place or commercial place.

(B2-2) When requested by the administering authority, odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

(B2-3) If monitoring indicates Condition (B2-1) is not being met then the environmental authority holder must:

a) address the complaint including the use of appropriate dispute resolution if required; and

b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.

END OF CONDITIONS FOR SCHEDULE B

Schedule C - Water

(C1-1) The holder of this authority must ensure that associated water is not released to land or waters, unless specifically authorised:

a) under this authority; or

b) under Section 186 of the *Petroleum and Gas (Production and Safety) Act 2004.*

Despite condition (C1-1) b), the holder of this authority must ensure that associated water to be used for domestic or stock purposes meets the accepted ANZECC 2000 Water Quality Guidelines, or subsequent versions thereof, for stock and domestic purposes.

(C1-2) Authorised releases of process water and storm water contaminated by petroleum activities to the Isaac River in accordance with conditions (C2-1) and (C2-2) shall be only during periods of natural flow events in compliance with Schedule C – Table 1 (Natural Flow Events). The duration of a natural flow event shall not be extended as a consequence of the petroleum activities water release.

Schedule C – Table 1 (Natural Flow Events)

Monitoring Point	Latitude (GDA94)	Longitude (GDA94)	Velocity	Minimum
Isaac River Crossing No.2 at the 132kV powerline (Isaac River Upstream)	-21° 57' 40.5"	148° 2' 10.64"	M^3/sec	> or = 5

Authorised Releases

(C2-1) Process water and storm water contaminated by petroleum activities must only be released to surface waters at the authorised release points as defined in Schedule C – Table 2 (Discharge Location) and in compliance with the release limits listed in Schedule C – Table 3 (End of pipe contaminant release limits).

Schedule C – Table 2 (Discharge Location)

Authorised Discharge Point	Latitude (GDA94)	Longitude (GDA94)	Location
Pond 5 Discharge Point (Isaac River)	-21° 57' 43.64"	148° 2' 28.09"	Daily during discharge events and for two days after cessation of discharge
Blair Athol Railway Bridge (Isaac River Downstream)	-21° 57' 59.81"	148° 2' 42.16"	Daily during discharge events and for two days after cessation of discharge

Schedule C – Table 3 (End of pipe contaminant release limits)

		Contaminant Limits	
Quality characteristics	**Units**	**Minimum**	**Maximum**
pH	pH units	6.5	8.5
Electrical Conductivity	µS/cm	N/A	2,500
Total Suspended Solids	mg/L	N/A	110% of upstream monitoring point
Total Petroleum Hydrocarbons (C6-C9)	mg/L	-	20
Total Petroleum Hydrocarbons (C10-C36)	mg/L	-	20

(C2-2) End of pipe release limits for process water and storm water contaminated by petroleum activities must be monitored at the locations and frequencies defined in Schedule C – Table 4 (monitoring location and frequency)

Schedule C – Table 4 (Monitoring locations and frequency)

Authorised Discharge Point	Latitude (GDA94)	Longitude (GDA94)	Location
Isaac River Crossing No.2 at the 132kV powerline (Isaac River Upstream)	-21° 57' 40.5"	148° 2' 10.64"	Daily during discharge events and for two days after cessation of discharge
Pond 5 Discharge Point (Isaac River)	-21° 57' 43.64"	148° 2' 28.09"	Daily during discharge events and for two days after cessation of discharge
Blair Athol Railway Bridge (Isaac River Downstream)	-21° 57' 59.81"	148° 2' 42.16"	Daily during discharge events and for two days after cessation of discharge

(C2-3) In addition to the quality characteristic limits specified in Schedule C Table 3 (End of pipe contaminant release limits), process water and storm water contaminated by petroleum activities released in accordance with conditions (C1-2), (C2-1) and (C2-1) must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm.

(C2-4) The authority holder must, within twenty-eight (28) days of a water release, provide a report to the administering authority detailing:

a) the reason for the release;

b) the location of the release;

c) all water quality monitoring results;

d) any general observations;

e) all calculations; and

f) any other matters pertinent to the water release event.

Dust Suppression and Civil Construction

(C3-1) Water may be used for the purpose of civil construction and dust suppression. Water may only be supplied if the quality of the water is in accordance with Schedule C – Table 5 (Dust Suppression and Civil Construction Limits).

Schedule C - Table 5 (Dust Suppression and Civil Construction Limits)

Parameter	Units	Minimum	Maximum
pH	n/a	6	9
TDS	Mg/L	n/a	2000

(C3-2) The water used for dust suppression and civil construction must not be discharged into water courses or near Endangered Regional Ecosystems.

Third Party Use

(C4-1) Wastewater generated from the authorised activities may be piped to Millennium Coal Mine ML70313 and ML7012 for use in coal washing and dust suppression.

C4-2) The authority holder when discharging to Millennium Coal Mine must record daily the following details:

a) time and date of the discharge;

b) TDS and pH levels of the discharge; and

c) total volume discharged.

Associated Water

(C5-1) Associated water other than that authorised in conditions C1-1, C4-1 and C4-2 must not be released for third party use without the approval of the administering authority.

Monitoring

(C6-1) The following information must be recorded in relation to all water sampling:

a) the date on which the sample was taken;

b) the time at which the sample was taken;

c) the monitoring point at which the sample was taken;

d) the measured or estimated daily flow of water contaminated by petroleum activities at the time of sampling; and

e) the results of all monitoring.

(C6-2) The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the Environmental Protection Agency's Water Quality Sampling Manual.

(C6-3) The holder of this authority must ensure all drill sumps/pits are installed and maintained to prevent any discharge through the bed or banks of the sumps/pits from causing environmental harm.

END OF CONDITIONS FOR SCHEDULE C

Schedule D - Noise

Noise Nuisance

(D1-1) Noise from activities must not cause an environmental nuisance at any noise sensitive place.

(D1-1) Noise emitted from the temporary petroleum activities must not exceed the noise acoustic quality objective of 55 dB(A)at any sensitive or commercial place.

(D2-1) Noise emitted from the permanent petroleum activities (other than the main North Queensland Gas Pipeline (NQGP) Compressor Station) must not exceed the noise levels, specified in the table below, at any sensitive place or commercial place.

Time period	Noise level at a sensitive place measured as the Adjusted Maximum Sound Pressure Level $L_{A, max, adj,T}$
7am– 6 pm	Background noise level plus 5 dB(A)
6pm–10pm	Background noise level plus 5 dB(A)
10pm–7am	Background noise level plus 3 dB(A)
Time period	Noise level at a commercial place measured as the Adjusted Maximum Sound Pressure Level $L_{A, max, adj,T}$
7am –6 pm	Background noise level plus 10 dB(A)
6pm–10pm	Background noise level plus 10 dB(A)
10pm–7am	Background noise level plus 8 dB(A)

General note: In no case is the background noise level, $L_{A90, 15 mins}$ to be less than 25 dB(A). In the event that measured background noise level is less than 25 dB(A), then 25 dB(A) is to be used.

(D2-2) When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring, analysis and interpretation of results.

Main NQGP Compressor Station

(D3-1) Should complaints about noise be received that are not frivolous, vexatious or based on mistaken belief, at the written request of the administering authority, the holder of this authority must undertake such work/actions as to achieve the levels shown in Schedule D – Table 2.

Schedule D - Table 2: Noise Limits

Noise level dB(A) measured as	Monday to Saturday			Sundays and Public Holidays		
	7am - 6pm	6pm - 10pm	10pm – 7am	9am - 6pm	6pm - 10pm	10pm - 9am
	Noise Measured at a 'Noise Sensitive Place' in Zones 1, 2, 4, 5, 9,12, 13*					
$L_{A10, adj, 10 mins}$	40	35	28	40	35	28
$L_{A1, adj, 10 mins}$	45	40	33	45	40	33
	Noise measured at a 'Commercial place' in Zones 1, 2, 4, 5, 9,12, 13*					
$L_{A10, adj, 10 mins}$	45	40	33	45	40	33
$L_{A1, adj, 10 mins}$	50	45	38	50	45	38
	Noise Measured at a 'Noise Sensitive Place' in Zones 3, 6, 7, 8, 10, 11, 14*					
$L_{A10, adj, 10 mins}$	45			45		
$L_{A1, adj, 10 mins}$	50			50		
$L_{Aeq, 10 mins}$ in sleeping areas (interior)	35					

* Refers to the Planning Scheme of the Shire of Belyando (Moranbah and environs) approved 23 February 1995

(D4) The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

END OF CONDITIONS FOR SCHEDULE D

Schedule E - Waste

Waste Management

(E1-1) The holder of this authority must not cause or permit incompatible wastes to be mixed in the same container, for example, mixing dangerous waste goods or those likely to react or mixing waste streams requiring different treatment and disposal methods.

(E1-2) The holder of this authority must ensure that petroleum activities do not result in the release or likely release of a hazardous contaminant to land or any watercourse, waterway, ground water, wetland or lake.

(E1-3) The holder of this authority must as soon as practicable remove and dispose of all hazardous contaminants and used batteries and waste oil to a licensed waste disposal facility or recycling facility.

(E1-4) All regulated waste removed from the site must be removed by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a facility licensed to accept such waste.

(E1-5) When regulated waste is removed from within the boundary of the petroleum authority and transported by the holder of this authority, a record must be kept of the following:

(a) date of waste transport;

(b) quantity of waste removed and transported;

(c) type of waste removed and transported;

(d) route selected for transport of waste;

(e) quantity of waste delivered; and

(f) any incidents (e.g. spillage) that may have occurred on route.

Sewage Treatment and Disposal

(E6) The holder of this authority must ensure that:

(a) plant and equipment used in the carrying out of the activity is installed, maintained and operated in a proper and efficient manner;
(b) sewage effluent is not released to waters (including groundwater);
(c) the disposal of sewage effluent does not cause the contamination of any water used for drinking or domestic purposes or manufacturing purposes or for consumption by animals;
(d) any area(s) used for the disposal of sewage wastes (liquids or solids) is securely fenced to prevent animals entering such area(s);
(e) where sewage sludge is buried on land the sludge is covered with at least 250mm of top soil and where practicable located above known flood levels;
(f) where sewage effluent is irrigated on land it is carried out in accordance with the National Water Quality Guidelines for Sewage Systems – Use of Reclaimed Water;
(g) there is no surface ponding of effluent on land disposal area(s);
(h) any noxious offence odours or any other noxious or offensive contaminant resulting from the activity do not cause a nuisance at any odour sensitive place; and
(i) public access to any sewage effluent land disposal area must be denied during the release of contaminants to the land and until the irrigation/disposal area has dried.

END OF CONDITIONS FOR SCHEDULE E

Schedule F – Land

Land Management

(F1-1) The holder of this authority must:

(a) take all reasonable and practicable measures to minimise disturbance to land; and

(b) ensure that the top layer of the soil profile is removed, where practicable, from areas to be significantly disturbed prior to the commencement of petroleum activities:

(i) stockpiled in a manner that will preserve its biological and chemical integrity, and

(ii) used for site rehabilitation in accordance with condition (F3-1).

Vegetation

(F2-1) The holder of this authority must take all reasonable and practicable measures to prevent or minimise disturbance to vegetation.

Rehabilitation Landform Criteria

(F3-1) As soon as practicable and within 6 months (or longer period agreed in writing with the administering authority) of the completion of petroleum activities causing significant disturbance to land, the holder of this authority must:

(a) remediate contaminated land (e.g. evaporation ponds containing hazardous waste) in accordance with *Environmental Protection Act 1994* requirements;

(b) reshape all significantly disturbed land to a stable landform similar to that of surrounding undisturbed areas;

(c) ensure that significantly disturbed land is reinstated to the pre-disturbed land suitability class;

(d) on all significantly disturbed land, take all reasonable and practicable measures to:
(i) re-establish surface drainage lines;
(ii) reinstate the top layer of the soil profile; and
(iii) promote establishment of vegetation of the same species and density of cover to that of the surrounding undisturbed areas;

(e) ensure that the water quality of any residual water bodies constructed by petroleum activities meets criteria for subsequent uses and does not have potential to cause environmental harm; and

(f) undertake rehabilitation in a manner such that any actual and potential acid sulphate soils in or on the site are either not disturbed, or submerged, or treated so as to not be likely to cause environmental harm.

Erosion

(F4-1) The holder of this authority must take all reasonable and practicable measures to prevent or minimise:
(a) erosion of areas disturbed by petroleum activities; and
(b) sedimentation of any waters as a result of petroleum activities.

Spills and Clean up Action

(F5-1) Notwithstanding the other conditions of this authority, if a hazardous contaminant is released to waters or land, the holder of this authority must:
(a) take immediate action to stop any further release;
(b) take immediate action to contain the hazardous contaminant to the affected area, taking particular care to protect environmentally sensitive areas;
(c) restore or rehabilitate the environment to its condition before the release occurred; and
(d) take necessary action to prevent a recurrence of the release.

Discharge to Evaporation Pond (Moranbah Gas Compressor Station)

(F6-1) Monitoring of waste water discharge to the evaporation pond must be undertaken on an annual basis. The monitoring must include determinations of salinity and hydrocarbon content.

(F6-2) Only process water from the compressor station containing salts and hydrocarbons and contaminated water from the interceptor pit is to be discharged to the evaporation pond.

Pond Conditions

(F7-1) The evaporation pond used for the storage of contaminants must be constructed, installed and maintained:

(a) so as to prevent any release of contaminants through the bed or banks of the pond to any waters (including ground water);
(b) so that a freeboard of not less than 0.5 metres is maintained at all times; and
(c) so as to ensure the stability of the pond's construction.

(F7-2) Suitable banks and/or diversion drains must be installed and maintained to exclude stormwater runoff from entering the evaporation pond or other structures used for the storage or treatment of contaminants or wastes except stormwater runoff held in the interceptor pit which is discharged into the evaporation pond.

(F7-3) Decommissioning the evaporation pond and interceptor pit must include:

(a) the management of salt or any residual hydrocarbon contaminated soil so that it does not cause environmental harm to surface waters or groundwater; and
(b) the rehabilitation, including re-vegetation, of the land so as to provide a stable landform and to prevent any environmental harm to the surrounding environment.

(F7-4) Investigation and testing of the sites is to be undertaken to determine if the soils are contaminated.

Note: Soil in the evaporation pond and interceptor pit is considered contaminated by hydrocarbons if the concentration of total petroleum hydrocarbons is greater than 1,000 mg/kg.

(F7-5) Any Contaminated soil must be managed in accordance with the procedures and processes set out in the latest edition of the Environmental Protection Agency's *Draft Guidelines for the Assessment and Management of Contaminated Land.*

Infrastructure

(F8-1) All infrastructure constructed by or for this authority holder, including water storage structures, must be removed by the holder from the site and the site rehabilitated prior to surrender of the petroleum authority, except where it is to remain with the written agreement of the administering authority and post-petroleum authority land owner / holder.

Environmentally sensitive areas

(F9-1) The holder of this authority must ensure that petroleum activities:

(a) are not conducted within a category A or B environmentally sensitive area; and

(b) are not conducted in a category C environmentally sensitive area unless there is a written agreement to enter the area from the relevant administering authority

END OF CONDITIONS FOR SCHEDULE F

Schedule G – Regulated Dams

All Dams

(G1-1) The holder of this authority must ensure any activities associated with this environmental authority do not compromise the integrity of any dam, either within the operational land or adjacent to the operational land.

(G1-2) The hazard category of each dam must be determined by a suitably qualified and experienced person, prior to its construction and at least once in each two (2) year period thereafter.

(G1-3) The holder of this authority must not commence construction of any dam determined to be in the significant or high hazard category, unless the location, basic details, and hydraulic performance of that dam are specifically referenced in this authority.

(G1-4) The holder of this authority must not abandon any dam but must decommission each dam so as to avoid any environmental harm.

(G1-5) As a minimum, decommissioning must be conducted such that each dam either:

a) becomes a stable landform, that no longer contains flowable substances, or
b) is approved or authorised under relevant legislation for a beneficial use, or
c) is a void authorised by the administering authority to remain after decommissioning; and
d) is compliant with the rehabilitation requirements of this authority

Regulated Dams – Location and Limits

(G2-1) The following regulated dams must be located within the control points defined in Schedule G - Table 1, below.

Schedule G — Table 1 (Location of Regulated dams)

NAME OF DAM/EVAPORATION POND CONTAINING HAZARDOUS WASTE [1]	LATITUDE (GDA 94)	LONGITUDE (GDA 94)
Pond 1	21 57' 57.54" 21 58' 01.36" 21 58' 05.16" 21 58' 01.28"	148 01' 06.45" 148 01 10.56" 148 01 06.50" 148 01 02.36"
Pond 2	21 58' 12.17" 21 58' 14.60" 21 58' 11.09" 21 58' 08.69"	148 02' 06.17" 148 02' 07.48" 148 02' 16.48" 148 02' 15.60"
Pond 3	21 57' 41.00" 21 57' 41.27" 21 57' 42.83"	148 02' 18.43" 148 02' 16.65" 148 02' 16.52"
Pond 4	21 57' 45.34" 21 57' 45.15" 21 57' 43.23" 21 57' 43.74"	148 02' 01.24" 148 01' 59.39" 148 01' 59.79" 148 02' 01.61"
Pond 5	21 57' 47.11" 21 57' 43.68" 21 57' 44.89"	148 02' 32.17" 148 02' 31.90" 148 02' 30.69"
Pond 6	21 57' 10.14" 21 57' 10.08" 21 57' 08.43"	148 01' 37.21" 148 01' 35.50" 148 01' 34.93"
Pond 7	21 57' 47.11" 21 57' 45.34" 21 57' 45.19"	148 03' 15.09" 148 03' 12.81" 148 03' 14.97"
Pond 8	21 59' 55.32" 21 59' 55.30" 21 59' 56.93" 21 59' 56.92"	148 4' 50.29" 148 4' 52.03" 148 4' 50.30" 148 4' 52.04"
Pond 9	27 51' 31.98" 21 51' 31.96" 21 51' 34.69" 21 51' 34.71"	148 02' 34.18" 148 02' 37.22" 148 02' 37.29" 148 02' 34.20"
Pond 10	21 58'07.00" 21 58'13.00" 21 58'18.00" 21 58'12.00"	148 01'07.00" 148 01'15.00" 148 01'09.00" 148 01'02.00"

Note : A minimum of 3 control points is required to constrain the location of all activities associated with the dam. Additional infrastructure which forms part of any dam may include appurtenant works consisting of tailings discharge pipelines, seepage collection systems, runoff diversion bunds, containment systems, pressure relief wells, decant and recycle water systems.

(G2-2) The following regulated dams must conform to the basic details in Schedule G - Table 2, below.

Schedule G — Table 2 (Basic Details of Regulated Dams)

NAME OF DAM/EVAPORATION POND CONTAINING HAZARDOUS WASTE	MAXIMUM SURFACE AREA OF DAM/EVAPORATION POND	MAXIMUM VOLUME OF DAM/EVAPORATION POND (M^3)	MAXIMUM DEPTH OF DAM/EVAPORATION POND (M)	PURPOSE OF DAM/EVAPORATION POND
Pond 1	32,400m^2	129,600m^3	4m	Contain and manage associated water
Pond 2	27,000m^2	108,000m^3	4m	Contain and manage associated water
Pond 3	4,225m^2	16,900m^3	4m	Contain and manage associated water
Pond 4	4,225m^2	16,900m^3	4m	Contain and manage associated water
Pond 5	4,225m^2	16,900m^3	4m	Contain and manage associated water
Pond 6	4,225m^2	16,900m^3	4m	Contain and manage associated water
Pond 7	4,225m^2	16,900m^3	4m	Contain and manage associated water
Pond 8	900m^2	3,600m^3	4m	Contain and manage associated water
Pond 9	5,497 m^2	5,480 m^3	3.4m	Contain and manage associated water
Pond 10	3.3ha	170ML	4.75m	Contain and manage associated water and RO concentrate

Regulated Dams – Hydraulic Requirements

(G3-1) The following regulated dams must meet the hydraulic performance criteria specified in Schedule G - Table 3, below.

Schedule G - Table 3 (Storage design * criteria for regulated dams)

Name of Regulated Dam	Spillway Capacity Critical Design Storm***	Mandatory **** Reporting Level
Pond 1	1 in 100 AEP	0.5m below spillway
Pond 2	1 in 100 AEP	0.5m below spillway
Pond 3	1 in 100 AEP	0.5m below spillway
Pond 4	1 in 100 AEP	0.5m below spillway
Pond 5	1 in 100 AEP	0.5m below spillway
Pond 6	1 in 100 AEP	0.5m below spillway
Pond 7	1 in 100 AEP	0.5m below spillway
Pond 8	1 in 100 AEP	0.5m below spillway
Pond 9	1 in 100 AEP	0.5m below spillway
Pond 10	1 in 100 AEP	0.5m below spillway

NOTE: AEP means Annual Exceedance Probability – being the probability that at least one event as specified will occur in a particular year.

* Calculations are to be carried out in accordance with the *Site Water Management Guideline in the Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

** The design storage allowance on 1st November of each year for any regulated dam constructed within the operational land must be sufficient to contain the run-off from the critical wet period - plus the volume of any other inputs to the storage facility during that critical wet period, as part of operations. Such inputs could be tailings, contaminated site waters, process waters, and any other materials.

*** The critical storm has a duration that produces the peak discharge for the catchment.

**** The level below spillway crest that can accommodate runoff from a 72 hour storm at the specified AEP, or the wave allowance at the specified AEP - whichever level is lower.

Regulated Dams – Certification and Operation

(G4-1) The holder of this authority must not commence construction of a regulated dam unless:

a) the holder has submitted to the administering authority two (2) copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam will deliver the performance stated in the design plan and that it will be compliant in all other respects with this authority, and

b) at least 20 business days has passed since the receipt of those documents, or the administering authority notifies the holder that a design plan and certification, has been received.

(G4-2) When construction of any regulated dam is complete, the holder of this authority must submit to the administering authority two (2) copies of a set of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the design plan and it is compliant in all respects with this authority.

(G4-3) An operational plan must be kept current for each regulated dam.

(G4-4) Where an operational plan covers decommissioning and rehabilitation, those operations are to be consistent with the design plan for the dam and the rehabilitation requirements of this authority.

(G4-5) The holder of this authority must notify the administering authority as soon as practicable when the level in any regulated dam reaches the mandatory reporting level (MRL), and immediately act to prevent or minimize any actual or potential environmental harm.

Regulated Dams – Annual Inspection and Report

(G5-1) Each regulated dam must be inspected annually by a suitably qualified and experienced person.

(G5-2) At each annual inspection, the condition and adequacy of each regulated dam must be assessed for dam safety and against the necessary structural, geotechnical and hydraulic performance criteria.

(G5-6) At each annual inspection, if a mandatory reporting level is required, it must be determined and marked on each regulated dam.

(G5-7) A final assessment of adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October and result in an estimate of the level in that dam as at 1 November.

(G5-8) For each annual inspection, two (2) copies of a report on the condition and adequacy of each regulated dam, certified by the suitably qualified and experienced person and including any recommended actions to be taken to ensure the integrity of each regulated dam; must be provided to the administering authority by 1 December.

(G5-9) The holder of this authority must, upon receipt of the annual inspection report, consider the report and its recommendations, and take action to ensure that each regulated dam safely performs its intended functions.

Regulated Dams – Decommissioning

(G6-1) Dams must be decommissioned in accordance with the requirements outlined in Appendix B of this authority. Dams must not be abandoned, but must be decommissioned to a situation where water can no longer be stored in the dams and the dams and their contained substance(s) are stable, where after the dams are no longer dams and they become landforms on the operational land and must comply with the rehabilitation requirements of this Environmental Authority.

(G6-2) Decommissioning activities for regulated dams must be documented in detail in the operations plan under which the activities are to occur. Where the detailed documentation is not already contained in the design plan for the regulated dam, the detailed documentation is considered to be an amendment to the design plan and must be submitted as an amendment to the design plan.

END OF CONDITIONS FOR SCHEDULE G

Schedule H - Community

Complaint response

(H1-1) All complaints received must be recorded including details of complainant, reasons for the complaint, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

(H1-2) In consultation with the administering authority, cooperate with and participate in any community environmental liaison committee established in respect of the area where the petroleum activity is undertaken.

Notification of Emergencies, Incidents and Exceptions

(H2-1) All reasonable actions are to be taken to minimise environmental harm, or the risk thereof, resulting from any emergency, incident or circumstances not in accordance with the conditions of this environmental authority.

(H2-2) As soon as practicable after becoming aware of any emergency, incident or information about circumstances which results or may result in environmental harm not in accordance with the conditions of this environmental authority, the administering authority must be notified in writing.

(H2-3) Not more than ten (10) days following the initial notification of an emergency, incident or information about circumstances which result or may result in environmental harm, written advice must be provided to the administering authority in relation to:

a) proposed actions to prevent a recurrence of the emergency or incident;

b) the outcomes of actions taken at the time to prevent or minimise environmental harm; and

c) proposed actions to respond to the information about circumstances which result or may result in environmental harm.

(H2-4) As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, written advice must be provided of the results of any such monitoring performed to the administering authority.

END OF CONDITIONS FOR SCHEDULE H

Definitions

Some of the words and phrases used throughout this authority are defined below:

Administering authority means -

(a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994* – the local government; or

(b) for all other matters – the Chief Executive of the Environmental Protection Agency; or

(c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.

APIA Code – means the current Australian Pipeline Industry Association - Code of Environmental Practice.

AS 2885 - Australian Standard - Pipelines – Gas and Liquid Petroleum.

Associated water is underground water taken from or interfered with from a petroleum well during the course of or resulting from carrying out petroleum activities. Associated water may be potable or suitable for stock purposes, or saline, high in fluoride, contain hydrocarbons, and/or is otherwise contaminated by a hazardous contaminant and become a hazardous waste.

Authorised place - means the place authorised under this authority for the carrying out of the specified environmentally relevant activities.

Background noise level $L_{A90,15min}$ means the A-weighted sound pressure level of the residual noise exceeded for 90% of a representative time period of not less than 15 minutes, using time weighting, 'F'.

Class R1 - means broad rural locations in undeveloped areas or broadly farmed areas that are sparsely populated, where typically the area of the average allotment is greater than 5ha.

Class R2 - means semi-rural locations in rural areas developed for small farms or rural residential use, where typically the area of the average allotment is between 1ha and 5ha.

Class T1 - means suburban locations in areas developed for residential commercial or industrial use at which the majority of buildings have less than four floors, where typically the area of the average allotment is less than 1ha.

Class T2 - means high-rise locations in areas developed for residential, commercial or industrial use at which the majority of buildings have four or more floors, where typically the area of the average allotment is less than 1ha.

Commercial place means a work place used as an office or for business or commercial purposes.

Contaminant - The *Environmental Protection Act 1994* defines, under Section 11, a contaminant as:

(a) a gas, liquid or solid; or

(b) an odour; or

(c) an organism (whether alive or dead), including a virus; or

(d) energy, including noise, heat, radioactivity and electromagnetic radiation; or

(e) a combination of contaminants.

Contaminated land - means land contaminated by a hazardous contaminant.

Commercial place - means a place used for business or commercial purposes.

Discharge area is:

(a) that part of the land surface where groundwater discharge produces a net movement of water out of the groundwater; and
(b) identified by an assessment process consistent with the document: Salinity Management Handbook, Queensland Department of Natural Resources, 1997; or
(c) identified by an approved salinity hazard map held by the Department of Natural Resources and Mines.

Dissects corridors of vegetation means clearing vegetation that results in a break more than 50 metres wide across a corridor.

Dispersible soils are soils in which clay material disintegrates into particles less than 2 microns when submerged in distilled water for 12 hours.

Dredge spoil - material taken from the bed or banks of waters by using dredging equipment or other equipment designed for use in extraction of earthen material.

Dust sensitive place - means:
a dwelling, mobile home or caravan park, residential marina or other residential place;
a motel, hotel or hostel;
a kindergarten, school, university or other educational institution;
a medical centre or hospital;
a protected area;
a park or gardens;
a place used as an office or for business or commercial purposes, and includes the curtilage of any such place.

Dwelling - means any of the following structures or vehicles that is principally used as a residence:
a house, unit, motel, nursing home or other building or part of a building;
a caravan, mobile home or other vehicle or structure on land;
a water craft in a marina.

Environmentally sensitive areas - (as determined from the EPA GIS data base) means locations, however large or small, that have environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical or cultural heritage value, or are important in providing amenity, harmony or sense of community.

Environmental Impact Statement - means the *Environmental Impact Statement* released by Enertrade in November 2002 and the *EIS Supplement: Response to Submissions* by Enertrade dated February 2003.

End means the stopping of the particular activity that has caused a significant disturbance in a particular area. It refers to, among other things, the end of a seismic survey or the end of a drilling operation. It does not refer to the end of all related *activities such as rehabilitation*. In other words, it does not refer to: the "completion" of the particular activity, the time at which the petroleum authority ends or the time that the land in question ceases to be part of an authority. Under the *APPEA Code* "completion" refers to the point at which the particular survey, program or operation has been rehabilitated and abandoned.

Essential habitat means an area identified as essential habitat for a species of wildlife listed as endangered, vulnerable, rare, or near threatened under the Nature Conservation Act 1992 on a map prepared by the chief executive officer of the Environmental Protection Agency and certified by the chief executive officer of the Department of Natural Resources and Mines for the purposes of the *Vegetation Management Act 1999*.

Evaporation pond means a dam or interceptor pond constructed outside a watercourse, wetland or waterway by excavating a pit and constructing a wall around the pit with the excavated material. Natural surface flow is excluded from the pond.

Financial assurance means a security deposit, either cash or a bank guarantee, held by the administering authority to cover the potential costs of rehabilitating areas significantly disturbed by the petroleum activities.

Groundwater means water from an underground source. (Schedule 17 *Water Regulation 2002)*

Hazardous contaminant - Schedule 3 of the *Environmental Protection Act 1994* defines a hazardous contaminant as "a contaminant that, if improperly treated, stored, disposed of or otherwise managed, is likely to cause serious or material environmental harm because of:

(a) its quantity, concentration, acute or chronic toxic effects, carcinogenicity, teratogenicity, mutagenicity, corrosiveness, explosiveness, radioactivity, flammability; or
(b) its physical, chemical or infectious characteristics. (e.g. spills of mercury, cyanide, petrol, diesel or oil)".

Land degradation includes the following:

(a) soil erosion;
(b) rising water tables;
(c) the expression of salinity;
(d) mass movement by gravity of soil or rock;
(e) stream bank instability; and
(f) a process that results in declining water quality.

Licensed waste disposal facility is a facility approved under a development approval and operated by a holder of a registration certificate for environmentally relevant activity item number 75 under Schedule 1 of the *Environmental Protection Regulation 1998.*

$L_{Linear\ peak}$ means the maximum reading in decibels (dB) obtained using the "P" time-weighting characteristic of sound level measuring equipment, as specified in AS 1259.1-1990 with all frequency-weighting networks inoperative.

"$L_{Aeq,T}$" means the A-weighted sound pressure level of a continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound under consideration whose level varies with time.

Lake - A natural or artificial body of water, either permanent or intermittent.

Maximum noise level. Max LpA means the highest noise level during a specified time period or during a specified number of events expressed as the absolute maximum level of the root-mean-square (r.m.s) sound pressure using time weighting "F".

Noise means a sound or vibration of any frequency, whether transmitted through air or any other physical medium.

Noise sensitive place - means:
a dwelling, mobile home or caravan park, residential marina or other residential premises; or
a motel, hotel or hostel; or
a kindergarten, school, university or other educational institution; or
a medical centre or hospital; or
a protected area; or
a park or gardens; or
a place used as an office or for business or commercial purposes, and includes the curtilage of such place.

Noxious - means harmful or injurious to health or physical well being.

Nuisance sensitive place" includes:
a dwelling, mobile home or caravan park, residential marina or other residential premises;
a motel, hotel or hostel;
a kindergarten, school, university or other educational institution;
a medical centre or hospital;
a protected area;
a park or gardens; or
a place used as an office or for business or commercial purposes, and includes the curtilage of any such place.

Odour sensitive place - has the same meaning as a "dust sensitive place".

Offensive - causing offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive.

Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads, pipelines etc), which is to be left by *agreement* with the landowner.

Petroleum activities means activities authorised to take place on land subject to a petroleum authority, including rehabilitation and decommissioning activities.

Petroleum authority includes Authority to Prospect, Petroleum Lease, Data Acquisition Authority, Water Monitoring Authority, Petroleum Facility Licence, Survey Licence and Pipeline Licence issued or granted under the *Petroleum Act 1923* or *Petroleum and Gas (Production and Safety) Act 2004.*

Petroleum works site is a separate location on the area subject to a petroleum authority where certain petroleum activities are undertaken; including a well site, production facilities, evaporation pond, compressor site and campsite. The following petroleum activities are excluded from the definition of *petroleum works site*: roads and tracks, seismic survey lines, and non-licensed gathering systems.

Pipeline land is **l**and on which a pipeline maybe constructed or operated under a pipeline licence (see P&G Act).

Potential discharge area - Low lying parts of the landscape (relative to adjacent terrain) where groundwater movements are within 2-5m of the land surface and the landscape may be subject to upward movement of groundwater in the future.

Petroleum authority is—

a) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; or
b) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; or
c) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982.*

Petroleum works site is a separate location on the area subject to a petroleum authority where petroleum activities are undertaken (e.g. a well site, seismic survey line, camp site, compressor site, evaporation pond etc).

Regulated waste - means non-domestic waste mentioned in Schedule 7 of the Environmental Protection Regulation 1998 (whether or not it has been treated or immobilised), and includes:
for an element - any chemical compound containing the element; and
anything that has contained the waste.

Release of a contaminant into the environment, includes –
(a) to deposit, discharge, emit or disturb the contaminant; and
(b) to cause or allow the contaminant to be deposited, discharged, emitted or disturbed; and
(c) to fail to prevent the contaminant from being deposited, discharged, emitted or disturbed; and
(d) to allow the contaminant to escape; and
(e) to fail to prevent the contaminant from escaping.

Residual noise means the ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

Sedimentation pond - a bunded or excavated structure used to contain and settle waterborne sediment running off disturbed areas.

Sensitive place means any of the following places –

a) a dwelling;
b) a library, childcare centre, kindergarten, school, college, university or other educational institution;
c) a hospital, surgery or other medical institution;

d) a protected area or an area identified under a conservation plan as a critical habitat or an area of major interest, under the *Nature Conservation Act 1992*;
e) a marine park under the *Marine Parks Act 1982*; and
f) a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment).

Significantly disturbed and **significant disturbance** mean a disturbance caused by the petroleum activities that require human intervention to be rehabilitated. Some examples include:

a) areas where soil has been compacted, removed, covered, exposed or stockpiled;
b) areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion;
c) areas where land use suitability or capability has been diminished;
d) areas within a watercourse, waterway, wetland or lake where petroleum activities occur and human intervention is necessary to restore or stabilise the disturbed area;
e) areas submerged by hazardous waste storage and dam walls in all cases;
f) areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after petroleum activities have ceased; or
g) areas where land has become contaminated land and a suitability statement has not been issued.

However, the following areas are not significantly disturbed:

a) areas off the petroleum authority (e.g. roads or tracks which provide access to the petroleum authority);
b) areas previously significantly disturbed which have been rehabilitated to the administering authority's satisfaction.
c) areas under permanent infrastructure.
d) areas that were significantly disturbed prior to the grant of the environmental authority, unless those areas are re-disturbed by the holder of the environmental authority during the term of the authority.
e) minor disturbances such as drill sumps and minor respreading of soil on GPS located seismic lines.

Stable means geo-technical stability of the rehabilitated landform where instability related to the excessive settlement and subsidence caused by consolidation / settlement of the wastes deposited, and sliding / slumping instability has ceased.

Top layer - The surface layer of a soil profile, which is usually more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from natural surface.

Watercourse means a river, creek or stream in which water flows permanently or intermittently in a visibly defined channel (natural, artificial or artificially improved) with:

(a) continuous bed and banks;
(b) an extended period of flow for some months after rain ceases, and
(c) an adequacy of flow that sustains basic ecological processes and maintains biodiversity.

Waters includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea) or any part-thereof, stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

Waterway - A naturally occurring feature where surface water runoff normally collects, such as a clearly defined swale or gully, but only flows in response to a local rainfall event.

END OFDEFINITIONS

APPENDIX B Decommissioning requirements for environmentally relevant containment facilities

Decommissioning:

(a) Removing (where possible) all remaining liquids in the containment facility (e.g. it is generally acceptable to evaporate the liquid if the containment facility is not to be left to the land owner / holder).

(b) Remove (where possible) all contaminated solids from the containment facility and encapsulate in a purpose built storage facility, or encapsulate any residual contaminated solids in situ by capping with an appropriate capillary break and with one metre of clay or similar impermeable material;

(c) Design, install and maintain adequate diversion drains or similar structures to protect or minimise the erosion of any exposed surfaces by stormwater runoff;

(d) Design, install and maintain adequate surface drainage to prevent water ponding and infiltration into any contaminated materials;

(e) Establish a monitoring program to determine the success of the decommissioning plan;

(f) If required, remove the wall of the containment facility; and

(g) Rehabilitate the disturbed areas in accordance with the rehabilitation conditions of this environmental authority.

END OF ENVIRONMENTAL AUTHORITY

APPENDIX C Location – Map of PL191


CONCEPT POND 12
P008
CM008V
PROPOSED POND 11
PROPOSED POND 10
PROPOSED RO PLANT
CM003
P008
NOTES
PREPARED FOR:
arrowenergy
go further
03-MAR-2011 A 1.08.08 PRELIMINARY ISSUE DN AH TN
REF DRG REV DATE DESCRIPTION DRN CHKD ENG QA APPD

MEMO

arrow energy
go further

TO:	Department of Environment and Resource Management	REF:	ENV10-209
FROM:	Arrow Energy Ltd		
DATE:	01/10/10		
SUBJECT:	Annual Return Reporting Information		

To DERM Delegate,

The following information is required to be lodged with the annual return for PEN100015907, dated 12 January 2010;

Table 1: Incident information

Brief Description	Cause	Associated Items	Date of Incident	Location	Immediate Action	Future Preventative Action
120,000L water flowing from open valve onto surrounding land areas, did not enter any endangered or of concern vegetation areas.	Human behaviour	Associated Water	23-Nov-09	Scour valve near Pond 8	Make area safe, Closed off valve, Report incident	Any other scour valves above ground to be buried to ensure they are not accessed by external members, SOP written for correct scour valve procedure, incident raised at wellfield meeting, Review EMS and procedures and make relevant staff in other areas/tea
An approximate volume of 10,000L has leaked out of the butterfly valve at the Pond one truck fill point. The valve was locked closed but due to the configuration of the locking mechanism on the valve handle the valve has	Equipment failure	Associated Water	14-Jan-10	Moranbah Pond 1	Valve was closed immediately upon arrival at site. Incident reported. Fence panels have erected around the valve site to ensure that	The design of the locking mechanism and the style of valve that is currently being used has now proven to be inadequate. The butterfly valve will be replaced with a stainless steel ball valve and the location of the pipe is to be lifted off the ground.

been able to be partially opened.					the valve can not be knocked open by cattle until the corrective actions are in place.	

Annual monitoring results for dams[1]

- Certificate of Analysis from ALS Laboratory Group (WO EV1013482, issue date 10/08/10)
- Quality Control Report from ALS Laboratory Group (WO EV1013482, issue date 10/08/10)
- Interpretive Quality Control Report from ALS Laboratory Group (WO EV1013482, issue date 10/08/10)
- Bureau Veritias International Trade Australia Pty Ltd- Water Analysis (MBE224394)

Please contact s73 -Non responsive in (Compliance and Reporting Manager), on s73 -Non responsive info or email [redacted] if you require any further information.

Kind Regards

s73

SENIOR ENVIRONMENT COORDINATOR

[1] The following documents are attached.

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB1013482**	Page	: 1 of 7
Client	: **ARROW ENERGY NL**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: [redacted]
Address	: P O BOX 7109 RIVERSIDE CENTRE BRISBANE QLD, AUSTRALIA 4001	Address	: [redacted]
E-mail	: [redacted]	E-mail	: [redacted]
Telephone	: [redacted]	Telephone	: [redacted]
Facsimile	: [redacted]	Facsimile	: [redacted]
Project	: MGP	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: JCH-PO16534		
C-O-C number	: ---	Date Samples Received	: 29-JUL-2010
Sampler	: [redacted]	Issue Date	: 10-AUG-2010
Site	: ---		
		No. of samples received	: 9
Quote number	: BN/364/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
[redacted]	Inorganic Chemist	Inorganics
	Senior Inorganic Chemist	Inorganics
	Organic Chemist	Organics
	Senior Inorganic Chemist	Inorganics

Environmental Division Brisbane
Part of the ALS Laboratory Group
32 Shand Street Stafford QLD Australia 4053
[redacted] 7218 www.alsglobal.com
A Campbell Brothers Limited Company

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: WATER				Client sample ID	DAM 1	DAM 10	DAM 6	DAM 2	DAM 3
				Client sampling date / time	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00
Compound	CAS Number	LOR	Unit		EB1013482-001	EB1013482-002	EB1013482-003	EB1013482-004	EB1013482-005
EA005: pH									
pH Value	---	0.01	pH Unit		9.10	9.31	8.55	---	---
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	---	1	µS/cm		11600	12500	7960	9540	40500
EA015: Total Dissolved Solids									
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L		5870	6250	4800	---	---
EA025: Suspended Solids									
^ Suspended Solids (SS)	---	1	mg/L		16	2	26	---	---
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	---	---
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		290	381	89	---	---
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		984	762	2390	---	---
Total Alkalinity as CaCO3	---	1	mg/L		1270	1140	2480	---	---
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		2	<1	22	---	---
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		3340	3890	1410	---	---
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		17	8	17	---	---
Magnesium	7439-95-4	1	mg/L		26	28	16	---	---
Sodium	7440-23-5	1	mg/L		2700	2880	2020	---	---
Potassium	7440-09-7	1	mg/L		17	20	10	---	---
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	---	---
Barium	7440-39-3	0.001	mg/L		5.83	8.62	3.68	---	---
Manganese	7439-96-5	0.001	mg/L		0.002	<0.001	0.016	---	---
Strontium	7440-24-6	0.001	mg/L		8.79	12.0	6.00	---	---
Boron	7440-42-8	0.05	mg/L		1.27	1.50	1.54	---	---
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	0.08	---	---
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.16	<0.01	0.03	---	---
Barium	7440-39-3	0.001	mg/L		5.90	8.24	3.88	---	---
Manganese	7439-96-5	0.001	mg/L		0.026	0.002	0.035	---	---
Strontium	7440-24-6	0.001	mg/L		9.58	12.4	7.05	---	---
Boron	7440-42-8	0.05	mg/L		1.30	1.45	1.51	---	---
Iron	7439-89-6	0.05	mg/L		0.22	0.05	1.15	---	---
EG052G: Silica by Discete Analyser									

Analytical Results

Sub-Matrix: WATER				Client sample ID	DAM 1	DAM 10	DAM 6	DAM 2	DAM 3
				Client sampling date / time	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00
Compound	CAS Number	LOR	Unit		EB1013482-001	EB1013482-002	EB1013482-003	EB1013482-004	EB1013482-005
EG052G: Silica by Discete Analyser - Continued									
Reactive Silica	---	0.10	mg/L		5.60	9.11	17.6	---	---
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		2.0	2.2	1.9	---	---
EN055: Ionic Balance									
^ Total Anions	---	0.01	meq/L		120	132	89.8	---	---
^ Total Cations	---	0.01	meq/L		121	129	90.5	---	---
^ Ionic Balance	---	0.01	%		0.49	1.55	0.34	---	---
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	---	1	mg/L		44	53	62	---	---
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	---	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	---	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	µg/L		<100	<100	230	<100	<100
C29 - C36 Fraction	---	50	µg/L		50	<50	760	<50	<50
^ C10 - C36 Fraction (sum)	---	50	µg/L		50	<50	990	<50	<50
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		103	100	102	106	98.5
Toluene-D8	2037-26-5	0.1	%		110	106	110	115	99.7
4-Bromofluorobenzene	460-00-4	0.1	%		99.0	93.5	96.9	101	87.0

Analytical Results

Sub-Matrix: WATER			Client sample ID	DAM 4	DAM 5	DAM 7	OWS DAM 6	---
			Client sampling date / time	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	27-JUL-2010 15:00	---
Compound	CAS Number	LOR	Unit	EB1013482-006	EB1013482-007	EB1013482-008	EB1013482-009	---
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	---	1	µS/cm	12300	12300	7430	89	---
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	---	20	µg/L	<20	<20	<20	<20	---
C10 - C14 Fraction	---	50	µg/L	<50	<50	<50	320	---
C15 - C28 Fraction	---	100	µg/L	<100	<100	<100	12400	---
C29 - C36 Fraction	---	50	µg/L	<50	<50	<50	54600	---
^ C10 - C36 Fraction (sum)	---	50	µg/L	<50	<50	<50	67300	---
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	97.1	102	98.8	120	---
Toluene-D8	2037-26-5	0.1	%	104	108	97.4	107	---
4-Bromofluorobenzene	460-00-4	0.1	%	90.3	97.3	86.3	94.9	---

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66.1	137.9
Toluene-D8	2037-26-5	79.2	119.6
4-Bromofluorobenzene	460-00-4	74.2	118.0

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB1013482**	Page	: 1 of 7
Client	: **ARROW ENERGY NL**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: [redacted]
Address	: P O BOX 7109 RIVERSIDE CENTRE BRISBANE QLD, AUSTRALIA 4001	Address	:
E-mail	: [redacted]	E-mail	: [redacted]
Telephone	: [redacted]	Telephone	:
Facsimile	: [redacted]	Facsimile	:
Project	: MGP	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ---		
C-O-C number	: ---	Date Samples Received	: 29-JUL-2010
Sampler	: [redacted]	Issue Date	: 10-AUG-2010
Order number	: JCH-PO16534		
		No. of samples received	: 9
Quote number	: BN/364/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
[redacted]	Inorganic Chemist	Inorganics
	Senior Inorganic Chemist	Inorganics
	Organic Chemist	Organics
	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1437336)									
EB1013462-021	Anonymous	EA005: pH Value	---	0.01	pH Unit	5.98	5.89	1.5	0% - 20%
EB1013470-010	Anonymous	EA005: pH Value	---	0.01	pH Unit	6.18	6.22	0.6	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1437989)									
EB1013482-004	DAM 2	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	9540	9710	1.8	0% - 20%
EB1013512-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	43000	42800	0.5	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1439446)									
EB1013482-001	DAM 1	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	11600	11500	0.4	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1437924)									
EB1013280-014	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	33	30	8.5	0% - 20%
EB1013362-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	353	355	0.6	0% - 20%
EA025: Suspended Solids (QC Lot: 1437938)									
EB1013368-002	Anonymous	EA025: Suspended Solids (SS)	---	1	mg/L	14	13	0.0	0% - 50%
EB1013508-005	Anonymous	EA025: Suspended Solids (SS)	---	1	mg/L	5	5	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 1439445)									
EB1013482-001	DAM 1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	290	290	0.0	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	984	981	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	1270	1270	0.2	0% - 20%
EB1013597-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	45	44	2.2	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	19	20	5.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	64	64	0.0	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1437380)									
EB1013482-001	DAM 1	ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	2	2	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 1437382)									
EB1013482-001	DAM 1	ED045G: Chloride	16887-00-6	1	mg/L	3340	3360	0.6	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1437381)									
EB1013482-001	DAM 1	ED093F: Calcium	7440-70-2	1	mg/L	17	15	6.9	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	26	25	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2700	2710	0.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	17	17	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1439656)									
EB1012642-042	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.142	0.146	2.6	0% - 20%
EB1012642-058	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.117	0.143	19.7	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1439658)									
EB1013481-011	Anonymous	EG020A-F: Barium	7440-39-3	0.001	mg/L	0.121	0.132	8.6	0% - 20%
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.035	0.038	7.6	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.13	0.15	14.5	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EB1013588-005	Anonymous	EG020A-F: Barium	7440-39-3	0.001	mg/L	0.010	0.011	15.9	0% - 50%
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	1.56	1.80	14.2	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1439871)									
EB1013482-001	DAM 1	EG020A-T: Barium	7440-39-3	0.001	mg/L	5.90	6.31	6.7	0% - 20%
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.026	0.028	6.7	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.16	0.19	14.7	0% - 50%
		EG020A-T: Boron	7440-42-8	0.05	mg/L	1.30	1.38	6.3	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.22	0.25	13.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1439872)									
EB1013482-001	DAM 1	EG020B-T: Strontium	7440-24-6	0.001	mg/L	9.58	10.0	4.2	0% - 20%
EG052G: Silica by Discete Analyser (QC Lot: 1440711)									
EB1013482-001	DAM 1	EG052G: Reactive Silica	—	0.10	mg/L	5.60	6.12	8.9	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 1439444)									
EB1013482-001	DAM 1	EK040P: Fluoride	16984-48-8	0.1	mg/L	2.0	1.9	0.0	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 1440785)									
EB1013482-001	DAM 1	EP005: Total Organic Carbon	—	1	mg/L	44	50	13.9	0% - 20%
EB1013517-007	Anonymous	EP005: Total Organic Carbon	—	1	mg/L	8	6	34.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1437911)									
EB1013432-006	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	<20	<20	0.0	No Limit
EB1013490-001	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	<20	<20	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005: pH (QCLot: 1437336)								
EA005: pH Value	---	0.01	pH Unit	---	7.00 pH Unit	99.2	99	115
EA010P: Conductivity by PC Titrator (QCLot: 1437989)								
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	1412 µS/cm	99.4	97	103
EA010P: Conductivity by PC Titrator (QCLot: 1439446)								
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	1412 µS/cm	98.6	97	103
EA015: Total Dissolved Solids (QCLot: 1437924)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	99.0	85	109
EA025: Suspended Solids (QCLot: 1437938)								
EA025: Suspended Solids (SS)	---	1	mg/L	<1	150 mg/L	96.0	82	120
ED037P: Alkalinity by PC Titrator (QCLot: 1439445)								
ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	---	200 mg/L	96.5	83	111
ED040F: Dissolved Major Anions (QCLot: 1437380)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	---	---	---	---
ED045G: Chloride Discrete analyser (QCLot: 1437382)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	89.1	70	128
ED093F: Dissolved Major Cations (QCLot: 1437381)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	---	---	---	---
ED093F: Magnesium	7439-95-4	1	mg/L	<1	---	---	---	---
ED093F: Sodium	7440-23-5	1	mg/L	<1	---	---	---	---
ED093F: Potassium	7440-09-7	1	mg/L	<1	---	---	---	---
EG020F: Dissolved Metals by ICP-MS (QCLot: 1439656)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.500 mg/L	100	85	119
EG020F: Dissolved Metals by ICP-MS (QCLot: 1439658)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	94.8	81	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	---	---	---	---
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	96.2	83	123
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.50 mg/L	100	70	129
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	99.4	79	128
EG020T: Total Metals by ICP-MS (QCLot: 1439871)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	92.6	70	128
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	---	---	---	---
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	108	79	129
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.500 mg/L	97.2	70	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1439871) - continued								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.500 mg/L	106	70	130
EG020T: Total Metals by ICP-MS (QCLot: 1439872)								
EG020B-T: Strontium	7440-24-6	0.001	mg/L	<0.001	0.500 mg/L	102	81	115
EG052G: Silica by Discete Analyser (QCLot: 1440711)								
EG052G: Reactive Silica	---	0.1	mg/L	<0.10	21.4 mg/L	92.0	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1439444)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	84.6	75	123
EP005: Total Organic Carbon (TOC) (QCLot: 1440785)								
EP005: Total Organic Carbon	---	1	mg/L	<1	100 mg/L	102	71	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1437438)								
EP071: C10 - C14 Fraction	---	50	µg/L	<50	1200 µg/L	84.4	49	125.5
EP071: C15 - C28 Fraction	---	100	µg/L	<100	2040 µg/L	80.2	58	131
EP071: C29 - C36 Fraction	---	50	µg/L	<50	---	---	---	---
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1437911)								
EP080: C6 - C9 Fraction	---	20	µg/L	<20	160 µg/L	103	73	135

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1437382)							
EB1013482-002	DAM 10	ED045G: Chloride	16887-00-6	400 mg/L	# Not Determined	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1439658)							
EB1013481-012	Anonymous	EG020A-F: Aluminium	7429-90-5	0.500 mg/L	92.1	70	130
		EG020A-F: Barium	7440-39-3	0.500 mg/L	98.8	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	101	70	130
		EG020A-F: Boron	7440-42-8	0.500 mg/L	88.4	70	130
EG020T: Total Metals by ICP-MS (QCLot: 1439871)							
EB1013482-002	DAM 10	EG020A-T: Barium	7440-39-3	1.000 mg/L	# Not Determined	70	130
		EG020A-T: Manganese	7439-96-5	1.000 mg/L	121	70	130
EG052G: Silica by Discete Analyser (QCLot: 1440711)							
EB1013482-001	DAM 1	EG052G: Reactive Silica	---	5.0 mg/L	107	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1439444)							
EB1012953-001	Anonymous	EK040P: Fluoride	16984-48-8	4.9 mg/L	85.8	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1437911)							
EB1013482-001	DAM 1	EP080: C6 - C9 Fraction	---	140 µg/L	83.9	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: EB1013482	Page	: 1 of 9
Client	: ARROW ENERGY NL	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: [redacted]
Address	: P O BOX 7109 RIVERSIDE CENTRE BRISBANE QLD, AUSTRALIA 4001	Address	:
E-mail	[redacted]	E-mail	[redacted] s47F 373
Telephone		Telephone	
Facsimile		Facsimile	
Project	: MGP	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: —		
C-O-C number	: —	Date Samples Received	: 29-JUL-2010
Sampler	[redacted]	Issue Date	: 10-AUG-2010
Order number	: JCH-PO16534		
		No. of samples received	: 9
Quote number	: BN/364/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005: pH							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	---	---	**03-AUG-2010**	27-JUL-2010	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural DAM 2, DAM 3, DAM 4, DAM 5, DAM 7, OWS DAM 6	**27-JUL-2010**	---	24-AUG-2010	---	**04-AUG-2010**	24-AUG-2010	✓
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	24-AUG-2010	---	**05-AUG-2010**	24-AUG-2010	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	---	---	**04-AUG-2010**	03-AUG-2010	×
EA025: Suspended Solids							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	---	---	**04-AUG-2010**	03-AUG-2010	×
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	10-AUG-2010	---	**05-AUG-2010**	10-AUG-2010	✓
ED040F: Dissolved Major Anions							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	24-AUG-2010	---	**03-AUG-2010**	24-AUG-2010	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural DAM 1, DAM 10, DAM 6	**27-JUL-2010**	---	24-AUG-2010	---	**03-AUG-2010**	24-AUG-2010	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	---	03-AUG-2010	---	**03-AUG-2010**	03-AUG-2010	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	---	23-JAN-2011	---	**05-AUG-2010**	23-JAN-2011	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	**05-AUG-2010**	23-JAN-2011	✓	**07-AUG-2010**	23-JAN-2011	✓
EG052G: Silica by Discete Analyser								
Clear Plastic Bottle - Natural								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	---	24-AUG-2010	---	**06-AUG-2010**	24-AUG-2010	✓
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	---	24-AUG-2010	---	**05-AUG-2010**	24-AUG-2010	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulphuric Acid								
DAM 1, DAM 6	DAM 10,	**27-JUL-2010**	---	---	---	**06-AUG-2010**	24-AUG-2010	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved								
DAM 1, DAM 6, DAM 3, DAM 5, OWS DAM 6	DAM 10, DAM 2, DAM 4, DAM 7,	**27-JUL-2010**	**03-AUG-2010**	03-AUG-2010	✓	**05-AUG-2010**	12-SEP-2010	✓
Amber VOC Vial - HCl								
DAM 1, DAM 6, DAM 3, DAM 5, OWS DAM 6	DAM 10, DAM 2, DAM 4, DAM 7,	**27-JUL-2010**	---	10-AUG-2010	---	**04-AUG-2010**	10-AUG-2010	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	3	20	**15.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Dissolved	ED040F	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	3	**66.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Dissolved	ED040F	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Major Cations - Dissolved	ED093F	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.3**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids	EA025	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Major Anions - Dissolved	ED040F	WATER	APHA 21st ed., 3120. The 0.45um filtered samples are determined by ICP/AES for Sulfur and/or Silcon content and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Metals by ICP-MS - Suite B	EG020B-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Silica (Reactive) by Discrete Analyser	EG052G	WATER	APHA 21st ed. 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Organic Carbon	EP005	WATER	APHA 21st ed., 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED045G: Chloride Discrete analyser	EB1013482-002	DAM 10	**Chloride**	16887-00-6	Not Determined	---	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG020T: Total Metals by ICP-MS	EB1013482-002	DAM 10	**Barium**	7440-39-3	Not Determined	---	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005: pH							
Clear Plastic Bottle - Natural							
DAM 1, DAM 6	DAM 10,	---	---	---	03-AUG-2010	27-JUL-2010	7
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural							
DAM 1, DAM 6	DAM 10,	---	---	---	04-AUG-2010	03-AUG-2010	1
EA025: Suspended Solids							
Clear Plastic Bottle - Natural							
DAM 1, DAM 6	DAM 10,	---	---	---	04-AUG-2010	03-AUG-2010	1

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Bureau Veritas International Trade Australia Pty Ltd
2 Colliery Street
P.O. Box 85
Moranbah QLD 4744
Tel: (61 7) 4941 6888 Fax: (61 7) 4941 6899
Email: moranbah.environmental@au.bureauveritas.com

REFERENCE:	MBE 224394
REPORT TITLE:	Water Analysis
CLIENT NAME AND ADDRESS:	[redacted] Arrow Energy Limited PO Box 335 MORANBAH QLD 4744
DATE SAMPLED:	27.09.10
DATE SAMPLES ANALYSED:	28.09.10 - 01.10.10
NUMBER OF PAGES:	3
REPORT STATUS:	This final report shall not be reproduced except in full.
SIGNATURE:	s.73 [redacted]
REPORTED BY:	Environmental Coordinator
DATE:	01/10/2010

BUREAU VERITAS

Job Number:	MBE224394
Report Status:	Final
Report Date:	01.10.10
Prepared By:	[redacted]
Sample Method:	AS5667.5
Sample Matrix:	Aqueous
Date Sampled:	27.09.10
Date Analysed:	28.09.10 - 01.10.10

Sample Description		Pond No. 6	MGPF Pond
Sample ID		MISC109001	MISC109002
[redacted]			
pH		8.07	6.14
EC	uS/cm	8640	486
Temperature	°C	24.8	24.6
TPH			
C6 - C9	ug/L	<50	<50
C10 - C14	ug/L	240	5900
C15 - C28	ug/L	430	31500
C29 - C36	ug/L	370	66900
Sum of TPH C10 - C36	ug/L	1040	104300
BTEX			
Benzene	ug/L	<1	<1
Toluene	ug/L	<1	<1
Ethylbenzene	ug/L	<1	<1
meta- & para-Xylene	ug/L	<2	<2
ortho-Xylene	ug/L	<1	<1
Dissolved Major Cations			
Calcium	mg/L	21.1	*
Magnesium	mg/L	29.6	*
Sodium	mg/L	2180	*
Potassium	mg/L	20.8	*
Chloride	mg/L	2260	18

Analysis performed by Labmark - Report No: E050314

* Sample results delayed due to laboratory equipment failure.

BUREAU VERITAS

Job Number:	MBE224394
Report Status:	Final
Report Date:	01.10.10
Prepared By:	sc73
Sample Method:	AS5667.5
Sample Matrix:	Aqueous
Date Sampled:	27.09.10
Date Analysed:	28.09.10 - 01.10.10

TESTING LABORATORIES	NATA Accreditation	Report Number(s)
Labmark	13542	E050314

Test Procedure	Laboratory	Method
TPH (C6 - C9)	Labmark	E029.1/E016.1
TPH (C10 - C36)	Labmark	E004.1
BTEX	Labmark	E029.1/E016.1
Major Cations	Labmark	E020.1/E030.1
Chloride	Labmark	E033.1/E045.1/E047.1

arrow energy
go further

Ref: ENV11-219

RECEIVED
31 OCT 2011
PaLM

31 October 2011

Permit and Licence Management
Department of Environment and Resource Management
GPO Box 2454,
BRISBANE QLD 4001

Dear Sir/Madam

PL191 and PL196– PEN100015907
Annual Return Reporting – 2010-2011
Annual Return Fee – 2011-2012

In response to the Notice of Annual Return relating to **PEN100015907**, Arrow Energy Pty Ltd[1] submits the following documents:

- Completed Annual Return for 2010-2011 reporting year.
- Annual return fee payment details 2011-2012($35,211.00 Remittance Advices).

Please contact me on s73 - Non responsive in or email s73 - Non responsive information if you require any further information.

Yours sincerely

s73

ACTING ENVIRONMENT MANAGER

[1] On behalf of Principal Holder and Joint Holders – CH4 Pty Limited

Department of Environment and Resource Management

RECEIVED
31 OCT 2011
PaLM

Annual Return

Environmental Protection Act 1994

Level 1 Chapter 5 and Chapter 5A Activities[1]

OFFICIAL USE ONLY
DATE RECEIVED

FILE REF:

PROJECT REF:

COMPLETE FORM:

☐

ADMINISTERING REGION:

ENTERED BY (SIGNATURE):

sch4(1)(c) Personal information

DATE:
02/11/11

Important information for holders of an Environmental Authority

This form must be completed annually by the holders of an Environmental Authority (EA) for level 1 mining projects or level 1 petroleum activities, under section 316 of the *Environmental Protection Act 1994* (EP Act).

Holders of an Environmental Authority (prospecting) or Environmental Authority (mining claim) are not required to submit an annual return and pay an annual fee.

For help in completing this form please refer to the **Guidance Notes** on the left of each page or if you have any questions about this annual return or any supporting information required please contact Permit and Licence Management on 1300 130 372.

The completed Annual Return is to be sent to: Permit and Licence Management, Implementation and Support Unit, Department of Environment and Resource Management, GPO Box 2454, Brisbane Qld 4001.

GUIDANCE NOTES

Questions 1 and 2

List the full names of the holders of the EA. Where there is more than one please list all.

Where there has been a change in the name of any holder, an application must be lodged to amend the Environmental Authority. Please contact Permit and Licence Management on 1300 130 372 for further information.

Annual Return details for 01 Oct 2010 to 30 Sep 2011

1. Environmental Authority holder (EA) name(s)

NAME(S):
CH4 Pty Limited

2. EA number(s)

EA NUMBER(S):
PEN100015907

[1] Chapter 5 of the *Environmental Protection Act 1994* provides for mining activities while Chapter 5A provides for petroleum, gas and other similar activities.

Department of Environment and Resource Management
www.derm.qld.gov.au ABN 46 640 294 485

Queensland Government

Question 3

Where there is more than one holder, all joint holders may appoint one holder as the principal holder to act on behalf of them all. The appointment may be made by giving DERM written confirmation signed by all the holders of the EA.

Please update contact details if incorrect by crossing out the details and printing the correct details beneath or on an attached sheet of paper.

3. Principal holder

NAME OR NAME OF COMPANY AND CONTACT PERSON: CH4 Pty Limited	
REGISTERED BUSINESS ADDRESS: 'AM 60' Level 19 42 Albert Street BRISBANE QLD 4000	
FULL POSTAL ADDRESS (WHERE DIFFERENT): PO Box 5262 BRISBANE QLD 4000	
TELEPHONE:	FACSIMILE:
MOBILE TELEPHONE:	EMAIL:

s73

Question 4

Please update contact details if incorrect by crossing out the details and printing the correct details beneath or on an attached sheet of paper.

4. Contact Person (where applicable)

NAME:	
POSITION AND COMPANY: Acting Environment Manager Arrow Energy Pty Ltd	
FULL POSTAL ADDRESS: PO Box 5262 Brisbane 4001	
TELEPHONE:	FACSIMILE:
MOBILE TELEPHONE:	EMAIL:

5. Does a condition of your Environmental Authority or Code of Environmental Compliance require you to carry out any monitoring and/or prepare reports on the activities for which you hold an Environmental Authority?

☒ Yes → Go to question 6

☐ No → Go to question 9

6. Has the monitoring that has been carried out shown any exceedance of the environmental limits set in the conditions of your EA or Code of Environmental Compliance?

☐ Yes → Please attach a copy of the notification of that exceedance that you gave to the administering authority.

☒ No

7. Has all of the necessary environmental monitoring been carried out and all the reports prepared in accordance with your EA or Code of Environmental Compliance?

☐ Yes

☒ No → Provide details below explaining why this has not occurred. If you require more space, attach additional information.

A program is in place to upgrade dam facilities which will include the installation of monitoring wells. Current monitoring utilises visual inspection only. Also, Sampling ports are being installed for Air Release monitoring.

Question 8

If you require more space, attach additional information.

Please do not submit the report(s) with this annual return.

8. Please provide details of the titles of all the monitoring data compiled and the reports prepared since your last annual return. Please provide details of the monitoring data and reports and where they are kept.

Table 1 List of Monitoring data required

NATURE OF REPORT AND /OR MONITORING	PREPARED BY	DATES COVERED	LOCATION OF REPORT
TEP - Discharge to Isaac River	GC - Arrow	Dec 2010 - May 2011	DERM

Questions 9 and 10

Section 320 of the EP Act imposes a duty on the holder to report serious or material environmental harm caused or threatened in the carrying out of an activity unless that harm is specifically authorised under an EA or Code of Environmental Compliance.

9. Since the date of the last annual return (or the date of issue in the case of a new EA), has the holder fully complied with the conditions of the EA or Code of Environmental Compliance?

☐ Yes → go to Question 11

☒ No → go to Question 10

10. For each condition of the EA or Code of Environmental Compliance with which the holder has not complied, please attach the following:

a) a statement of whether or not the non-compliance has been previously reported;

b) a statement describing the non-compliance incident including photographs where appropriate;

c) a statement describing the environmental impacts resulting from the non-compliance incident;

d) a statement describing the actions taken to repair any damage to the environment.

Tick to indicate that the required statements are attached ☑

Question 11

Further notes for Table 2:

Where financial years are the basis of the relevant operational plan, financial years are to be stated in Table 2. Otherwise, state the period on which the plan is based (e.g. Jan 2009 to Jan 2010).

11. Summary of disturbance and rehabilitation (see Table 2 below)

Please state the areas of actual disturbance and rehabilitation and the areas planned in accordance with the relevant operational plan (plan of operations or environmental management plan or other work programs). Complete Table 2.

Table 2: Summary of disturbance and rehabilitation

Status of land	Amount of change rehabilitation in reporting year 10/10 to 9/11	
	Planned	Actual
Total area disturbed prior to period		67.6
Total area disturbed (including rehabilitated areas) (ha) during period	233	
Total area rehabilitated (ha) during period	NIL	
Total area remaining disturbed[1] (ha) at end of period		67.6

[1] Area remaining disturbed - is calculated by subtracting areas that have been successfully rehabilitated from the area disturbed prior and during the period.

Questions 12
Annual fees are worked out in accordance with section 120 of the *Environmental Protection Regulation 2008.*

The annual fee is based on the highest Aggregate Environmental Score multiplied by M - Specified in Section 120 of the *Environmental Protection Regulation 2008* - and must be submitted with this annual return.

[2] See the information sheet Summary of annual fees for environmentally relevant activities (ERAs), available at www.derm.qld.gov.au or through Permit and Licence Management (phone 1300 130 372).

Annual fees have been excluded from GST by the Commonwealth Government.

12. List all the environmentally relevant activities (ERAs listed in Schedules 2, 5 and 6 of the *Environmental Protection Regulation 2008)* conducted as part of the activity authorised by the authorised EA[2]

ERA numbers	Threshold	Aggregate Environmental Score
8	3a	no score
9	3c	64
15	1	35
60	1d	110
63	2b	27

Question 13
For details of the eligibility criteria please refer to the information sheet *Paying a reduced annual fee* which is available from the department's website.

NOTE: The reduced annual fee does not apply if the annual return and fees are not submitted by the due date or if there is no aggregate environmental score.

13. Are you claiming a reduced annual fee under sections 121-127 of the *Environmental Protection Regulation 2008*?

☐ Yes → A reduced annual fee cannot be claimed unless *Appendix A - Claiming a reduced annual fee* is completed. Please complete Appendix A and return it together with this annual return form.

☒ No → Go to Question 14

Question 14

Please read carefully through the declaration before signing.

Under section 480 of the EP Act, it is an offence to knowingly give the administering authority information that is false, misleading or incomplete in any material particular.

14. Declaration

- I / We, being the holders identified at Section 1, acknowledge that all information supplied on or with this application form may be made available upon request, subject to the provisions of the *Right to Information Act 2009* and the *Evidence Act 1977*.
- I am the holder or the appointed signatory for the Environmental Authority.
- I am aware that under section 480 of the *Environmental Protection Act 1994*, it is an offence to knowingly give the administering authority information that I know is false, misleading or incomplete in any material particular.
- I have supplied all of the required information.

SIGNATURE: [redacted]	
NAME OF SIGNATORY [redacted]	
POSITION OF SIGNATORY (IE DIRECTOR, MANAGER, OWNER, PARTNER, CEO ETC): Acting Environment Manager	DATE:

Please return your completed annual return to:

Permit and Licence Management
Implementation and Support Unit
Department of Environment and Resource Management
GPO Box 2454
Brisbane Queensland 4001
Enquiries: 1300 130 372
Facsimile: (07) 3896 3342
E-mail: palm@derm.qld.gov.au

Question 10

For each condition of the EA or Code of Environmental Compliance with which the holder has not complied:

CH4 Pty Limited is in the process of preparing a Draft TEP with DERM. The contact officers at DERM are Sarah Tincknell and John Frankish

Annual Return

Environmental Protection Act 1994

Level 1 Chapter 5 and Chapter 5A Activities[1]

OFFICIAL USE ONLY
DATE RECEIVED:

FILE REF:

PROJECT REF:

COMPLETE FORM:

☐

ADMINISTERING REGION:
Gas & Petroleum

ENTERED BY [SIGNATURE]:

DATE:

Important information for holders of an Environmental Authority

This form must be completed annually by the holders of an Environmental Authority (EA) for level 1 mining projects or level 1 petroleum activities, under section 316 of the *Environmental Protection Act 1994* (EP Act).

Holders of an Environmental Authority (prospecting) or Environmental Authority (mining claim) are not required to submit an annual return and pay an annual fee.

For help in completing this form please refer to the **Guidance Notes** on the left of each page or if you have any questions about this annual return or any supporting information required please contact Permit and Licence Management on 1300 130 372.

The completed Annual Return is to be sent to: Permit and Licence Management, Implementation and Support Unit, Department of Environment and Heritage Protection, GPO Box 2454, Brisbane Qld 4001.

GUIDANCE NOTES

Questions 1 and 2

List the full names of the holders of the EA. Where there is more than one please list all.

Where there has been a change in the name of any holder, an application must be lodged to amend the Environmental Authority. Please contact Permit and Licence Management on 1300 130 372 for further information.

Annual Return details for 01 Oct 2011 to 30 Sep 2012

1. Environmental Authority holder (EA) name(s)

NAME(S):
CH4 Pty Limited

2. EA number(s)

EA NUMBER(S):
PEN100015907

[1] Chapter 5 of the *Environmental Protection Act 1994* provides for mining activities while Chapter 5A provides for petroleum, gas and other similar activities.

Question 3

Where there is more than one holder, all joint holders may appoint one holder as the principal holder to act on behalf of them all. The appointment may be made by giving written confirmation signed by all the holders of the EA.

Please update contact details if incorrect by crossing out the details and printing the correct details beneath or on an attached sheet of paper.

3. Principal holder

NAME OR NAME OF COMPANY AND CONTACT PERSON: CH4 Pty Limited	
REGISTERED BUSINESS ADDRESS: 'AM 60' Level 19 42 Albert Street BRISBANE CITY QLD 4000	
FULL POSTAL ADDRESS (WHERE DIFFERENT): PO Box 5262 BRISBANE CITY QLD 4000	
TELEPHONE: [redacted]	FACSIMILE:
MOBILE TELEPHONE: [redacted]	EMAIL: [redacted]

s73 73

Question 4

Please update contact details if incorrect by crossing out the details and printing the correct details beneath or on an attached sheet of paper.

4. Contact Person (where applicable)

NAME: [redacted]	
POSITION AND COMPANY: Environment Manager - Operations Arrow Energy Pty Ltd	
FULL POSTAL ADDRESS: PO Box 5262 Brisbane 4000	
TELEPHONE: [redacted]	FACSIMILE:
MOBILE TELEPHONE: [redacted]	EMAIL: [redacted]

Level 1 Chapter 5 and Chapter 5A Activities

5. Does a condition of your Environmental Authority or Code of Environmental Compliance require you to carry out any monitoring and/or prepare reports on the activities for which you hold an Environmental Authority?

☒ Yes → Go to question 6

☐ No → Go to question 9

6. Has the monitoring that has been carried out shown any exceedance of the environmental limits set in the conditions of your EA or Code of Environmental Compliance?

☐ Yes → Please attach a copy of the notification of that exceedance that you gave to the administering authority.

☒ No

7. Has all of the necessary environmental monitoring been carried out and all the reports prepared in accordance with your EA or Code of Environmental Compliance?

☒ Yes

☐ No → Provide details below explaining why this has not occurred. If you require more space, attach additional information.

Question 8

If you require more space, attach additional information.

Please do not submit the report(s) with this annual return.

8. Please provide details of the titles of all the monitoring data compiled and the reports prepared since your last annual return. Please provide details of the monitoring data and reports and where they are kept.

Table 1 List of Monitoring data required

NATURE OF REPORT AND /OR MONITORING	PREPARED BY	DATES COVERED	LOCATION OF REPORT
Groundwater Monitoring Report	s73	Q1 - Q2 2012	Arrow Bne.
Dam Register	Arrow & Wak Jam	October	Arrow Brisbane

Level 1 Chapter 5 and Chapter 5A Activities

Questions 9 and 10

Section 320 of the EP Act imposes a duty on the holder to report serious or material environmental harm caused or threatened in the carrying out of an activity unless that harm is specifically authorised under an EA or Code of Environmental Compliance.

9. Since the date of the last annual return (or the date of issue in the case of a new EA), has the holder fully complied with the conditions of the EA or Code of Environmental Compliance?

☐ Yes → go to Question 11

☒ No → go to Question 10

Note: Compliance issues are currently being managed in consultation with the regulatory authority.

10. For each condition of the EA or Code of Environmental Compliance with which the holder has not complied, please attach the following:

a) a statement of whether or not the non-compliance has been previously reported;

b) a statement describing the non-compliance incident including photographs where appropriate;

c) a statement describing the environmental impacts resulting from the non-compliance incident;

d) a statement describing the actions taken to repair any damage to the environment.

Tick to indicate that the required statements are attached ☐

Statements are attached.

Question 11

Further notes for Table 2:

Where financial years are the basis of the relevant operational plan, financial years are to be stated in Table 2. Otherwise, state the period on which the plan is based (e.g. Jan 2009 to Jan 2010).

11. Summary of disturbance and rehabilitation (see Table 2 below)

Please state the areas of actual disturbance and rehabilitation and the areas planned in accordance with the relevant operational plan (plan of operations or environmental management plan or other work programs). Complete Table 2.

Level 1 Chapter 5 and Chapter 5A Activities

Table 2: Summary of disturbance and rehabilitation

Status of land	Amount of change rehabilitation in reporting year 1/10 to 30/9/12	
	Planned	Actual
Total area disturbed prior to period	[redacted]	35.490
Total area disturbed (including rehabilitated areas) (ha) during period	-	
Total area rehabilitated (ha) during period	-	7.35
Total area remaining disturbed[1] (ha) at end of period	[redacted]	28.14

[1] Area remaining disturbed - is calculated by subtracting areas that have been successfully rehabilitated from the area disturbed prior and during the period.

Questions 12
Annual fees are worked out in accordance with section 120 of the *Environmental Protection Regulation 2008*.

The annual fee is based on the highest Aggregate Environmental Score multiplied by M - Specified in Section 120 of the *Environmental Protection Regulation 2008* - and must be submitted with this annual return.

[2] See the information sheet Summary of annual fees for environmentally relevant activities (ERAs), available at www.ehp.qld.gov.au or through Permit and Licence Management (phone 1300 130 372).

Annual fees have been excluded from GST by the Commonwealth Government.

12. List all the environmentally relevant activities (ERAs listed in Schedules 2, 5 and 6 of the *Environmental Protection Regulation 2008*) conducted as part of the activity authorised by the authorised EA[2]

ERA numbers	Threshold	Aggregate Environmental Score
8	3a	no score
9	3c	64
15	1	35
60	1d	110
63	2b	27

Question 13
For details of the eligibility criteria please refer to the information sheet *Paying a reduced annual fee* which is available from the department's website.

NOTE: The reduced annual fee does not apply if the annual return and fees are not submitted by the due date or if there is no aggregate environmental score.

13. Are you claiming a reduced annual fee under sections 121-127 of the *Environmental Protection Regulation 2008*?

☐ Yes → A reduced annual fee cannot be claimed unless *Appendix A - Claiming a reduced annual fee* is completed. Please complete Appendix A and return it together with this annual return form.

☒ No → Go to Question 14

Question 14

Please read carefully through the declaration before signing.

Under section 480 of the EP Act, it is an offence to knowingly give the administering authority information that is false, misleading or incomplete in any material particular.

14. Declaration

- I / We, being the holders identified at Section 1, acknowledge that all information supplied on or with this application form may be made available upon request, subject to the provisions of the *Right to Information Act 2009* and the *Evidence Act 1977*.
- I am the holder or the appointed signatory for the Environmental Authority.
- I am aware that under section 480 of the *Environmental Protection Act 1994*, it is an offence to knowingly give the administering authority information that I know is false, misleading or incomplete in any material particular.
- I have supplied all of the required information.

SIGNATURE:	
MOA for s.73	
NAME OF SIGNATORY:	
POSITION OF SIGNATORY (IE DIRECTOR, MANAGER, OWNER, PARTNER, CEO ETC): Operations Manager Chief Operations Officer	DATE:

Please return your completed annual return to:

Permit and Licence Management
Implementation and Support Unit
Department of Environment and Heritage Protection
GPO Box 2454
Brisbane Queensland 4001
Enquiries: 1300 130 372
Facsimile: (07) 3896 3342
E-mail: palm@ehp.qld.gov.au

Ref: ENV12-225

4 October 2012

Permit and Licence Management
Department of Environment and Heritage Protection
GPO Box 2454,
BRISBANE QLD 4001

Dear Sir/Madam

PL 191, 196 & PL115 – PEN100015907
Annual Return Reporting – 1 October 2011 – 30 September 2012
Annual Return Fee – 2012-2013

In response to the Notice of Annual Return relating to **PEN100015907** Arrow Energy Pty Ltd[1] submits the following documents:

- Completed Annual Return for 1 October 2011 – 30 September 2012 reporting year and this includes two attachments for the response of Question 10 of this annual return form.
- The Annual Return fee for 2012-2013 of $36,432.00. This relates to Invoice No. 379577 which was paid with the remittance advice being emailed to cplreceipting@ssa.qld.gov.au.
- Dam Register – 5 October 2012
- Groundwater Monitoring Report – First and Second Quarter of 2012
- Response to Section 316a requirements of the Environmental Protection Act 1994.
  The Environmental Protection Act 1994 – Section 316a submission is considered to meet the necessary requirements of Condition G14 of Environmental Authority PEN100015907 relating to the Progress Report of the Release Reduction Strategy. Hence a separate document has now been provided in regards to Condition G14.

Please contact s73 [redacted] or email [redacted] if you require any further information.

Yours sincerely

[redacted]

MOA for [redacted]
OPERATIONS MANAGER – CHIEF OPERATIONS OFFICER

[1] On behalf of Principal Holder – CH4 Pty Ltd

36595 - 21 G.11

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PaLM

Annual Return

Environmental Protection Act 1994

Level 1 Chapter 5 and Chapter 5A Activities[1]

OFFICIAL USE ONLY
DATE RECEIVED:

FILE REF:

PROJECT REF:

COMPLETE FORM:

☐

ADMINISTERING REGION:
Gas & Petroleum

ENTERED BY [SIGNATURE]:
Tash

DATE:
16 | 10 | 12

Important information for holders of an Environmental Authority

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Holders of an Environmental Authority (prospecting) or Environmental Authority (mining claim) are not required to submit an annual return and pay an annual fee.

For help in completing this form please refer to the **Guidance Notes** on the left of each page or if you have any questions about this annual return or any supporting information required please contact Permit and Licence Management on 1300 130 372.

The completed Annual Return is to be sent to: Permit and Licence Management, Implementation and Support Unit, Department of Environment and Heritage Protection, GPO Box 2454, Brisbane Qld 4001.

GUIDANCE NOTES

Questions 1 and 2

List the full names of the holders of the EA. Where there is more than one please list all.

Where there has been a change in the name of any holder, an application must be lodged to amend the Environmental Authority. Please contact Permit and Licence Management on 1300 130 372 for further information.

Annual Return details for 01 Oct 2011 to 30 Sep 2012

1. Environmental Authority holder (EA) name(s)

NAME(S):
CH4 Pty Limited

2. EA number(s)

EA NUMBER(S):
PEN100015907

[1] Chapter 5 of the *Environmental Protection Act 1994* provides for mining activities while Chapter 5A provides for petroleum, gas and other similar activities.

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Where there is more than one holder, all joint holders may appoint one holder as the principal holder to act on behalf of them all. The appointment may be made by giving written confirmation signed by all the holders of the EA.

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REGISTERED BUSINESS ADDRESS: 'AM 60' Level 19 42 Albert Street BRISBANE CITY QLD 4000
FULL POSTAL ADDRESS (WHERE DIFFERENT): PO Box 5262 BRISBANE CITY QLD 4000
TELEPHONE: [redacted] FACSIMILE:
MOBILE TELEPHONE: [redacted] EMAIL: [redacted]

Question 4

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NAME: s73 [redacted]
POSITION AND COMPANY: Environment Manager - Operations Arrow Energy Pty Ltd
FULL POSTAL ADDRESS: PO Box 5262 Brisbane 4000
TELEPHONE: [redacted] FACSIMILE:
MOBILE TELEPHONE: [redacted] EMAIL: [redacted]

Level 1 Chapter 5 and Chapter 5A Activities

5. Does a condition of your Environmental Authority or Code of Environmental Compliance require you to carry out any monitoring and/or prepare reports on the activities for which you hold an Environmental Authority?

☒ Yes → Go to question 6

☐ No → Go to question 9

6. Has the monitoring that has been carried out shown any exceedance of the environmental limits set in the conditions of your EA or Code of Environmental Compliance?

☐ Yes → Please attach a copy of the notification of that exceedance that you gave to the administering authority.

☒ No

7. Has all of the necessary environmental monitoring been carried out and all the reports prepared in accordance with your EA or Code of Environmental Compliance?

☒ Yes

☐ No → Provide details below explaining why this has not occurred. If you require more space, attach additional information.

Question 8

If you require more space, attach additional information.

Please do not submit the report(s) with this annual return.

8. Please provide details of the titles of all the monitoring data compiled and the reports prepared since your last annual return. Please provide details of the monitoring data and reports and where they are kept.

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Level 1 Chapter 5 and Chapter 5A Activities

Questions 9 and 10

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9. Since the date of the last annual return (or the date of issue in the case of a new EA), has the holder fully complied with the conditions of the EA or Code of Environmental Compliance?

☐ Yes → go to Question 11

☒ No → go to Question 10

Note: Compliance issues are currently being managed in consultation with the regulatory authority.

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a) a statement of whether or not the non-compliance has been previously reported;

b) a statement describing the non-compliance incident including photographs where appropriate;

c) a statement describing the environmental impacts resulting from the non-compliance incident;

d) a statement describing the actions taken to repair any damage to the environment.

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Statements are attached.

Question 11

Further notes for Table 2:

Where financial years are the basis of the relevant operational plan, financial years are to be stated in Table 2. Otherwise, state the period on which the plan is based (e.g. Jan 2009 to Jan 2010).

11. Summary of disturbance and rehabilitation (see Table 2 below)

Please state the areas of actual disturbance and rehabilitation and the areas planned in accordance with the relevant operational plan (plan of operations or environmental management plan or other work programs). Complete Table 2.

Level 1 Chapter 5 and Chapter 5A Activities

Table 2: Summary of disturbance and rehabilitation

Status of land	Amount of change rehabilitation in reporting year 1/10 to 30/9/12	
	Planned	Actual
Total area disturbed prior to period	[redacted]	35.490
Total area disturbed (including rehabilitated areas) (ha) during period	—	
Total area rehabilitated (ha) during period	—	1.35
Total area remaining disturbed[1] (ha) at end of period	[redacted]	28.14

[1] Area remaining disturbed - is calculated by subtracting areas that have been successfully rehabilitated from the area disturbed prior and during the period.

Questions 12
Annual fees are worked out in accordance with section 120 of the *Environmental Protection Regulation 2008*.

The annual fee is based on the highest Aggregate Environmental Score multiplied by M - Specified in Section 120 of the *Environmental Protection Regulation 2008* - and must be submitted with this annual return.

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Annual fees have been excluded from GST by the Commonwealth Government.

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ERA numbers	Threshold	Aggregate Environmental Score
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13. Are you claiming a reduced annual fee under sections 121-127 of the *Environmental Protection Regulation 2008*?

☐ Yes → A reduced annual fee cannot be claimed unless *Appendix A - Claiming a reduced annual fee* is completed. Please complete Appendix A and return it together with this annual return form.

☒ No → Go to Question 14

Question 14

Please read carefully through the declaration before signing.

Under section 480 of the EP Act, it is an offence to knowingly give the administering authority information that is false, misleading or incomplete in any material particular.

14. Declaration

- I / We, being the holders identified at Section 1, acknowledge that all information supplied on or with this application form may be made available upon request, subject to the provisions of the *Right to Information Act 2009* and the *Evidence Act 1977*.
- I am the holder or the appointed signatory for the Environmental Authority.
- I am aware that under section 480 of the *Environmental Protection Act 1994*, it is an offence to knowingly give the administering authority information that I know is false, misleading or incomplete in any material particular.
- I have supplied all of the required information.

SIGNATURE: MOA for s73	
NAME OF SIGNATORY:	
POSITION OF SIGNATORY (IE DIRECTOR, MANAGER, OWNER, PARTNER, CEO ETC): Operations Manager Chief Operations officer	DATE:

Please return your completed annual return to:

Permit and Licence Management
Implementation and Support Unit
Department of Environment and Heritage Protection
GPO Box 2454
Brisbane Queensland 4001
Enquiries: 1300 130 372
Facsimile: (07) 3896 3342
E-mail: palm@ehp.qld.gov.au

RESPONSE REGARDING ANNUAL RETURN QUESTION 10:

10 (a) a statement of whether or not the non-compliance has been previously reported

No. This non-compliance has not been previously reported.

10 (b) a statement describing the non-compliance incident...

The Operational Plan expires on 1 October, 2012, and a revised plan has not been provided to the administering authority less than three months prior to the expiry of the current plan as required under EA condition A9.

10(c) a statement describing the environmental impacts resulting from the non-compliance incident

There are no anticipated environmental impacts resulting from this non-compliance.

10(d) a statement describing the actions taken to repair any damage to the environment.

Not applicable. Arrow has recently implemented a staff restructure and the responsibility for the Operations Plan has been reassigned. Arrow will provide an updated Operations Plan to EHP as a matter of priority.

RESPONSE REGARDING ANNUAL RETURN QUESTION 10:

10 (a) a statement of whether or not the non-compliance has been previously reported

This non-compliance has not been previously reported.

10 (b) a statement describing the non-compliance incident...

A third-party audit of the Operational Plan for the relevant prior period was not submitted to the administering authority in accordance with the timeframes set in condition (A15).

10(c) a statement describing the environmental impacts resulting from the non-compliance incident

There are no anticipated environmental impacts resulting from this non-compliance.

10(d) a statement describing the actions taken to repair any damage to the environment.

Not applicable. Arrow is in the process of engaging a third party auditor, and anticipate that the field inspections will be completed early-November 2012.

arrow energy
go further

5-Oct-12
Arrow Energy
PL 191 "Regulated Dam Register"

General			
Asset Base	Site	Description Dam / Pond Name	Label
Northern	PL191	Moranbah Aggregation Water Dam 1	MB-DE-001
Northern	PL191	Moranbah Aggregation Water Dam 2	MB-DE-002
Northern	PL191	Moranbah Aggregation Water Dam 3	MB-DA-001
Northern	PL191	Moranbah Aggregation Water Dam 4	MB-DA-002
Northern	PL191	Moranbah Aggregation Water Dam 5	MB-DA-003
Northern	PL191	Moranbah Aggregation Water Dam 6	MB-DA-004
Northern	PL191	Moranbah Aggregation Water Dam 7	MB-DA-005
Northern	PL191	Moranbah Aggregation Water Dam 9	MB-DA-007
Northern	PL191	Moranbah Aggregation Water Dam 10	MB-DE-003
Northern	PL191	Moranbah Brine Storage Dam 11	MB-DB-001
Northern	PL191	Moranbah Treated Water Dam 14	MB-DT-001
Northern	PL191	Moranbah Camp Sewage Treatment Dam	MB-DW-001
Northern	PL191	Moranbah Wastewater Dam 13	MB-DW-002

GIS information									
CLASS	SUB_CLASS	Actual Contents	Regulated (Y/N)	Hazard Category	Service	Status	Lot_plan	ET_X GDA94	ET_Y GDA94
Dam	Aggregation	CSG Water	Y	Significant	Aggregation	Exist	s.73	148.018	-21.967
Dam	Aggregation	CSG Water	Y	Significant	Aggregation	Exist		148.036	-21.970
Dam	Aggregation	CSG Water	Y	Significant	Transfer	Exist		148.038	-21.962
Dam	Aggregation	CSG Water	Y	Significant	Transfer	Exist		148.034	-21.962
Dam	Aggregation	CSG Water	Y	Significant	Transfer	Exist		148.042	-21.963
Dam	Aggregation	CSG Water	Y	Significant	Transfer	Exist		148.027	-21.952
Dam	Aggregation	CSG Water	Y	Low	Transfer	Exist		148.054	-21.963
Dam	Aggregation	CSG Water	Y	Low	Transfer	Exist		148.044	-21.858
Dam	Aggregation	CSG Water	Y	Significant	Aggregation	Exist		148.020	-21.969
Dam	Brine	CSG Water	Y	Significant	MGP RO CSG concentrate	Exist		148.009	-21.947
Dam	Treated Water	CSG Water	N	N/A	MGP RO treated water	Planned		148.004	-21.959
Dam	Aggregation	CSG Water	N	Low	MGP Sewage Storage	Exist		148.005	-21.981
Dam	Processing	Oily Water	Y	Significant	MGP CGPF oily water discharge	Exist		148.237	-21.980

Catchment Area (ha)	Structural Height (m)	Footprint Area (ha)	Internal batter slope (1 in z)	External batter slope (1 in z)	Crest width (m)
3.98	2.50	3.98	3.50	3.50	3.50
2.54	3.50	3.69	3.50	3.00	3.50
0.34	1.35	0.52	3.00	2.50	2.00
0.35	1.60	0.58	4.00	3.50	2.00
0.34	1.20	0.57	4.00	3.50	2.00
0.32	2.50	0.80	3.50	6.00	5.00
0.33	2.00	0.64	3.00	4.00	3.50
0.38	3.00	0.63	3.50	6.00	4.00
4.59	3.34	6.24	4.00	4.00	4.00
0.87	6.60	11.24	4.00	4.00	5.00
3.79	7.00	5.06	3.50	3.00	4.00
0.14	3.00	0.24	2.50	2.50	4.00
0.87	3.00		2.00	2.00	4.00

Liner Type	Leak Detection	Crest Level m(AHD)	Crest Volume (ML)	Hydraulic Height (Spillway level) m(AHD)	Hydraulic Height Capacity (ML)	DSA Design Storage Allowance m(AHD)	MRL Mandatory Reporting Level m(AHD)
CCL	No	227.40	119.66	227.40	119.66	226.55	227.05
CCL	No	225.40	92.64	225.40	28.00	222.30	225.05
0.5mm HDPE	No	224.20	7.49	224.20	7.49	223.35	223.85
0.5mm HDPE	No	226.50	7.10	226.50	7.10	225.65	226.15
0.5mm HDPE	No	222.80	7.64	222.80	7.64	221.95	222.45
0.5mm HDPE	No	227.20	6.41	227.20	6.41	226.35	226.85
0.5mm HDPE	No	222.00	7.68	222.00	7.68	221.15	221.65
1.5mm HDPE	No	277.80	11.00	277.50	9.90	276.65	277.15
1.5mm HDPE	No	227.50	203.70	226.75	163.00	225.90	226.40
1.5mm HDPE - Double	Yes	239.20	503.00	238.20	419.00	237.40	237.40
1.5mm HDPE	Yes (Proposed)	239.00	193.00	238.50	208.00	237.58	238.10
1.5mm HDPE	No	258.30	1.88	258.30	1.88	257.45	257.95
1mm HDPE	No	265.65	20.00	265.49	19.10	264.64	265.14

Year of Construction*	Date of Entry into Register	Owner	Annual Inspection Date	Annual DSA Assessment Date	Submitted to Regulator	Design Plan Engineer	"As constructed" Drawings Issuer
2004	Prior to 14/9/10	Arrow Energy	1-Nov	1-Nov	no	Worley Parsons	Arrow Energy
2004	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	Worley Parsons	Arrow Energy
2004	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	Old E & A dams 6 & 7 are transfer dams 6 to 1 and 7 to 2 built after 3,4 & 5. Worley Parsons for Dam 8 and Stafford did the certification	Arrow Energy
2004	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no		Arrow Energy
2005	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no		Arrow Energy
2005	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no		Arrow Energy
2005	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no		Arrow Energy
2008	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	Stafford Adamson & Associates	Arrow Energy
2009	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	Stafford Adamson & Associates	Stafford Adamson & Associates
May-11	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	yes	Stafford Adamson & Associates	Stafford Adamson & Associates
2012	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	GHD	GHD
2009	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	Stafford Adamson & Associates	Delco
2004	Prior to 14/9/11	Arrow Energy	1-Nov	1-Nov	no	GHD	GHD

Date Construction Certified	Name and Qualifications of Certifier	Constructor	Date Inspected for Structural and Operational Adequacy	Date Structure and Operation Report was submitted to Administering Authority	Date Inspected for detection of leakage through liner*	Date Inspected for Available Storage Capacity for 1 Nov Report
Prior to condition	URS	Ogilvie	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Ogilvie	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Arrow	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Arrow	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Arrow	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Arrow	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Arrow	Jun-11		Jun-11	Sep-11
Prior to condition	URS	Sweetman/ Precise Lining	Jun-11		Jun-11	Sep-11
Sep-11	Stafford Adamson & Associates	Lindley Mining / Ogilvie	Jun-11		Jun-11	Sep-11
Jun-11	Stafford Adamson & Associates	Ostwalds	Sep-11	Jul-10	Continuous	Sep-11
	GHD	Ostwalds	Not yet constructed		Not yet constructed	Not yet constructed
	URS	Delco	Jun-11		Jun-11	Sep-11
	URS	Enertrade NQGP Alliance	Jun-11		Jun-11	Sep-11

arrow energy
go further

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Interim Groundwater Monitoring Report Petroleum Lease (PL) 191/196

Reporting Period: Quarter 1 and Quarter 2, 2012

TABLE OF CONTENTS

1 INTRODUCTION

CH4 Pty Ltd (CH4) has completed groundwater monitoring in accordance with the groundwater monitoring program (GMP) (Arrow Energy, 03-V-PL-2017) developed pursuant to Level 1 Environmental Authority (EA) PEN100015907.

This EA covers petroleum leases (PLs): PL191, PL196, and Petroleum Pipeline Lease (PPL) PPL115. Based on the activities undertaken by Arrow on these leases, and previous assessments of these activities (as described further in the foregoing) groundwater monitoring is relevant to PL191 only. The location of PL191 is shown in **Appendix A**.

This *interim* report provides the results and preliminary assessment of groundwater monitoring completed for quarter 1 and quarter 2 2012 on PL191. The groundwater monitoring and data collection for this reporting period was completed by Worley Parsons under contract with CH4.

Note that as provided in the GMP, a more comprehensive report the monitoring results will be prepared following the completion of four consecutive quarters of groundwater monitoring.

2 BACKGROUND

The following summarises background information relevant to the development and implementation of the GMP.

2.1 Petroleum Activities

CH4 operates 11 regulated dams on PL191 (note that there are no regulated dams on PL196). The regulated and non-regulated dams on PL191 are summarised in **Table 2-1**. The locations of the dams are shown in **Appendix A**.

Table 2-1 Summary Dam 8 groundwater monitoring bore network

Site	Description (Dam / Pond Name)	Label	Regulated (Y/N)	Service
PL191	Moranbah Evaporation Water Dam 1	MB-DE-001	Y	Aggregation
PL191	Moranbah Evaporation Water Dam 2	MB-DE-002	Y	Aggregation
PL191	Moranbah Aggregation Water Dam 3	MB-DA-001	Y	Transfer
PL191	Moranbah Aggregation Water Dam 4	MB-DA-002	Y	Transfer
PL191	Moranbah Aggregation Water Dam 5	MB-DA-003	Y	Transfer
PL191	Moranbah Aggregation Water Dam 6	MB-DA-004	Y	Transfer
PL191	Moranbah Aggregation Water Dam 7	MB-DA-005	Y	Transfer
PL191	Moranbah Aggregation Water Dam 9	MB-DA-007	Y	Transfer
PL191	Moranbah Evaporation Water Dam 10	MB-DE-003	Y	Aggregation

Site	Description (Dam / Pond Name)	Label	Regulated (Y/N)	Service
PL191	Moranbah Brine Storage Dam 11	MB-DB-001	Y	MGP RO CSG concentrate
PL191	Moranbah Treated Water Dam 14 (NOT COMMISSIONED)	MB-DT-001	N	MGP RO treated water
PL191	Moranbah Camp Sewage Treatment Dam	MB-DW-001	N	MGP Sewage Storage
PL191	Moranbah Wastewater Dam 13	MB-DW-002	Y	MGP CGPF oily water discharge
PL191	076GR	076GR	N	Exploration
PL191	078GR	078GR	N	Exploration
PL191	068GR	068GR	N	Exploration
PL191	074GR	074GR	N	Exploration

2.2 Risk Assessment

A risk assessment was undertaken in November 2011 (Arrow Energy, 99-V-REP-0009) to assess the risks to groundwater associated with authorised petroleum activities within PLs 191 and 196 (s.73) The objective of this Risk Assessment was to provide information to aid in developing groundwater monitoring programs for each respective project area. The Risk Assessment concluded that based on water quality data and the ecological and hydrogeological setting, no activities within the project areas covered by the risk assessment were identified as having viable pathways posing a significant or high risk of impact to groundwater that would affect the beneficial use of groundwater.

2.3 Groundwater Monitoring Program

The GMP (Arrow Energy, 03-V-PL-2017) was developed to meet conditions I11 to I17 of Level 1 Environmental Authority (petroleum activities) PEN100015907. Note that the GMP was developed under the version of this EA taking effect 8 July 2011. The EA has since been amended; however, the conditions pertaining to groundwater monitoring have not changed.

Notwithstanding the results of the Risk Assessment, conditions I13 and I14 required the installation and monitoring of a groundwater monitoring bore network to monitor groundwater in the vicinity of each of the regulated dams on this lease. Pursuant to these conditions, the groundwater monitoring bore network must include a sufficient number of monitoring sites to provide information on the following:

- Seepage from the dam to groundwater and surrounding soils and its effect on groundwater and soils; and
- Background groundwater quality (i.e. groundwater quality in representative bore(s) that have not been affected by the activities authorised under the EA).

Details regarding the monitoring scope, sampling, and analysis are provided in the GMP. This document provides interim trigger levels for comparative purposes during the first 12 months of monitoring, which are used for the purposes of this report. The development of longer-term

trigger levels will be completed later following the establishment of background water quality based on the first 12 months of monitoring.

2.4 Groundwater Monitoring Bore Network

The groundwater monitoring bore network is summarised in **Table 2-2**. The locations of these bores are shown in **Appendix B**.

Table 2-2 Summary of groundwater monitoring bore network

Dam Name	Bore ID	Monitoring Purpose	Screen Interval (metres below grade level)	Groundwater-bearing zone description	Approx. Static Water Level at time of installation (metres bTOC)
Dam 1 & Dam 10	M225W	Upgradient	28 - 34	Silty SAND w/ gravel (weathered Tertiary basalt)	23.9
	M226W	Adjacent	16 - 22	Silty CLAY, gravelly CLAY, clayey GRAVEL (weathered Tertiary basalt)	17.1
	M227W	Adjacent	14.5 - 20.5	Silty CLAY, GRAVEL (weathered Tertiary basalt)	16.2
	M228W	Adjacent	20 - 35	Gravelly CLAY, clayey GRAVEL (weathered Tertiary basalt)	14.9
	M229W	Adjacent	14 - 23	Clayey SAND (weathered Tertiary basalt)	15.2
	M230W	Downgradient	29 - 32	Gravelly CLAY (weathered Tertiary basalt)	16.7
Dam 2	M231W	Upgradient	7.4 - 13.4	Sandy CLAY, clayey GRAVEL (weathered Tertiary basalt)	9.2
	M232W	Adjacent	8.2 - 14.2	Clayey GRAVEL, clayey SAND w/ gravel, silty SAND w/ gravel (Quaternary alluvium)	9.5
	M233W	Adjacent	8.3 - 14.3	Clayey SILT w/ fine sand (Quaternary alluvium)	9.8
	M234W	Downgradient	11.2 - 17.2	Clayey SAND (Quaternary alluvium)	11.6
Dam 3	M235W	Upgradient	12.9 - 14.4	GRAVEL (weathered Tertiary basalt)	13.6
	M236W	Adjacent	12 - 18	Sandy CLAY, clayey SAND (weathered Tertiary basalt)	12.2
	M237W	Adjacent	5 - 16	Sandy CLAY w/ gravel (Quaternary alluvium)	11.8
Dam 4	M238W	Adjacent	11 - 17	Gravelly CLAY (alluvium)	15.6
	M239W	Adjacent	16.5 - 20.5	Sandy GRAVEL w/ clay (weathered Tertiary basalt), clayey SAND (Quaternary alluvium)	15.4
	M240W	Adjacent	11 - 17	Sandy CLAY (Quaternary alluvium)	15.5
Dam 5	M241W	Upgradient	14.7 - 17.7	Gravelly CLAY (weathered Tertiary basalt)	14.7
	M242W	Adjacent	9 - 14	Gravelly CLAY (weathered Tertiary basalt)	9.4
	M243W	Adjacent	9.5 - 13.5	Sandy CLAY (weathered Tertiary basalt)	10.8

Dam Name	Bore ID	Monitoring Purpose	Screen Interval (metres below grade level)	Groundwater-bearing zone description	Approx. Static Water Level at time of installation (metres bTOC)
Dam 6	M244W	Upgradient	26.5 - 32.5	SAND w/ coal (weathered Ft. Cooper coal measures)	15.3
	M245W	Adjacent	24 - 30	Clayey GRAVEL, clayey SAND (Quaternary alluvium & weathered Tertiary basalt)	20.4
	M246W	Adjacent / Downgradient	22 - 28	Silty & clayey SAND & GRAVEL (weathered Tertiary basalt)	16.7
Dam 7	M247W	Downgradient	10 - 16	Silty CLAY (weathered Ft. Cooper Coal Measures)	14.2
	M248W	Adjacent	15.2 - 21.2	Silty & clayey SAND (Quaternary alluvium) and COAL (weathered Ft. Cooper Coal measures)	10.3
	M249W	Adjacent	11.75 - 17.75	COAL & CLAY (weathered Ft. Cooper Coal measures)	10.4
Dam 9	M250W	Upgradient	44.5 - 56.5	SAND (Tertiary alluvium)	51.9
	M251W	Adjacent	14 - 20	CLAY (Tertiary alluvium)	19.8
	M252W	Downgradient	33 - 45	SAND (Tertiary alluvium)	40.0
Dam 11	M329W	Adjacent	26.2 - 35.2	CLAY (weathered Tertiary basalt)	33.2
	M330W	Adjacent	11 - 17	Groundwater not encountered	dry
	M331W	Adjacent	7 - 13	Groundwater not encountered	dry
	M332W	Adjacent	7 - 10	Groundwater not encountered	dry
	M339W	Upgradient	35 - 41	CLAY (weathered Tertiary basalt)	37.3
	M340W	Downgradient	19.3 - 27.3	Silty CLAY (weathered Tertiary basalt)	20.1
Dam 13	M253W	Upgradient	18 - 30	Groundwater not encountered	dry
	M254W	Adjacent	25 - 31	Groundwater not encountered	dry
	M255W	Downgradient	16 - 22	Groundwater not encountered	dry

3 PURPOSE

The purpose of this report is to comply with the data analysis and interpretation requirements specified in Section 7.3 of the GMP and condition I16 of EA PEN100016907. The data analysis and interpretations presented in this document are focused on identification of evidence in the groundwater monitoring data that may indicate whether impact to groundwater resulting from the operation of dams has occurred.

4 SCOPE OF MONITORING COMPLETED

The quarter 1 and quarter 2 groundwater monitoring events were completed by Worley Parsons in February to March 2012 and June 2012, respectively.

4.1 Groundwater Monitoring Locations Sampled

The monitoring completed during quarter 1 and quarter 2 included gauging and sampling of all wells within the PL191 groundwater bore network, with the exception of the wells that were dry at the time of sampling. **Table 4-1** summarises the monitoring completed.

Table 4-1 Summary of groundwater monitoring completed for quarter 1 and quarter 2, 2012

Dam Name	Groundwater Monitoring Bore	Quarter 1 2012		Quarter 2 2012	
		Well Sampled	Comments	Well Sampled	Comments
Dam 1 & Dam 10	M225W	Y	-	Y	-
	M226W	Y	-	Y	-
	M227W	Y	-	Y	-
	M228W	Y	-	Y	-
	M229W	Y	-	Y	-
	M230W	Y	-	Y	-
Dam 2	M231W	Y	-	Y	-
	M232W	Y	-	Y	-
	M233W	Y	-	Y	-
	M234W	Y	-	Y	-
Dam 3	M235W	Y	-	Y	-
	M236W	Y	-	Y	-
	M237W	Y	-	Y	-
Dam 4	M238W	Y	-	Y	-
	M239W	Y	-	Y	-
	M240W	Y	-	Y	-
Dam 5	M241W	Y	-	Y	-
	M242W	Y	-	Y	-
	M243W	Y	-	Y	-
Dam 6	M244W	Y	-	Y	-

Dam Name	Groundwater Monitoring Bore	Quarter 1 2012		Quarter 2 2012	
		Well Sampled	Comments	Well Sampled	Comments
	M245W	Y	-	Y	-
	M246W	Y	-	Y	-
Dam 7	M247W	Y	-	Y	-
	M248W	Y	-	Y	-
	M249W	Y	-	Y	-
Dam 9	M250W	Y	-	Y	-
	M251W	Y	-	N	dry
	M252W	Y	-	Y	-
Dam 11	M329W	Y	-	Y	-
	M330W	N	dry	N	dry
	M331W	N	dry	N	dry
	M332W	N	dry	N	dry
	M339W	Y	-	Y	-
	M340W	Y	-	Y	-
Dam 13	M253W	N	dry	N	dry
	M254W	N	dry	N	dry
	M255W	N	dry	N	dry

4.2 Groundwater Monitoring Parameters

The groundwater monitoring parameters included for the quarter 1 and quarter 2 groundwater monitoring events are shown in **Table 1**.

5 ASSESSMENT CRITERIA

Table 5-1 presents the interim assessment criteria established in the GMP.

Table 5-1 Interim trigger levels based on existing water quality guidelines

Parameter	Units	Interim Trigger Levels
pH	pH scale	6 – 8.5
Electrical conductivity	mS/cm or µS/cm	2.15 2150
Total dissolved solids	mg/L	0 - 4000

Parameter	Units	Interim Trigger Levels
Ca^{2+}	mg/L	84
Mg^{2+}	mg/L	108
Na^{+}	mg/L	<115
Cl^{-}	mg/L	<175
SO_4^{2-}	mg/L	140
HCO_3^{-}	mg/L	536

6 RESULTS

The results of the groundwater monitoring completed during this reporting period are shown in **Table 1** (attached).

Note that the data presented in this report was collected and provided by Worley Parsons on behalf of Arrow. A quality assurance/quality control review and report are pending for these results. Therefore, the results and interpretations presented in this document are preliminary. This document is provided as an interim measure to meet reporting requirements until four consecutive quarters of monitoring are completed, after which a comprehensive report will be prepared.

The following outlines the results from the quarter 1 and quarter 2 groundwater monitoring events as compared to interim trigger levels:

pH

The pH primary sample analytical results showed values that ranged from 4.9 to 7.26, and averaged 6.46 across all of the wells. The majority of results were within or slightly below the interim trigger values. Of the results that were below the interim trigger values, most were within 0.5 pH units of the low range trigger value (i.e. greater than pH 5.5). In addition, the preponderance of pH values were within a range of 5.5 to 7.0 pH units. This suggests that naturally-occurring pH conditions are somewhat lower than what is reflected in the interim trigger level range of 6.0 to 8.5.

The lowest pH values were recorded from wells located in the vicinity of Dam 9 (M250W, M251W, M252W). These results included a pH value of 5.40 in upgradient groundwater monitoring well M250W during the quarter 2 sampling event, and 4.90 in adjacent groundwater monitoring well M251W during the quarter 1 sampling event.

The pH values tend to be consistent between the quarter 1 and quarter 2 groundwater monitoring events. The majority of samples from respective wells were within 0.2 pH units between the quarter 1 and quarter 2 groundwater monitoring events.

Electrical Conductivity/Total Dissolved Solids

EC primary sample analytical results ranged from 503 µS/cm to 48,600 µS/cm and TDS values from 424 mg/L to 44,200 mg/L. The average EC and TDS results were 18,088 µS/cm and 13,421 mg/L, respectively. EC and TDS results from the preponderance of the samples were markedly above the interim trigger levels. This included 55 of 61 samples collected for EC and 45 of 61 samples for TDS.

There were, however, specific monitoring locations where EC and/or TDS results were below the interim trigger values for both quarter 1 and quarter 2. These included samples from the following groundwater monitoring wells: M232W (Dam 2), M236W (Dam 3), and M240W (Dam 4). In addition, most of the results from groundwater monitoring wells in the vicinity of Dam 9 were only marginally above the EC interim trigger values, and all were below the TDS trigger values.

EC values varied significantly from well cluster to well cluster. In most cases the results within well clusters were similar in range, although there were a few clusters that contained one well with results that were significantly different from that of the other wells (notably Dam 2 and Dam 4).

The EC values tended to be consistent between the quarter 1 and quarter 2 groundwater monitoring events for respective wells. With the exception of the results from groundwater monitoring well M237W, the relative percent difference between the quarter 1 and quarter 2 primary sample results for each respective well was within 32% (most were within 10%). The relative percent difference between the quarter 1 and quarter 2 samples from M237W was somewhat higher at 72%. Similar comparisons were observed for the TDS results.

Bicarbonate Alkalinity

Bicarbonate alkalinity (as $CaCO_3$) primary sample analytical results showed concentrations that ranged from 10 mg/L to 1,290 mg/L, and averaged 547 mg/L. Approximately half of the results, 36 of 61 samples collected, exceeded the interim trigger levels.

The values tend to show relatively low variability within samples from each cluster of wells around each dam, and a higher level of variability from well cluster to well cluster.

The bicarbonate alkalinity values tended to be consistent between the quarter 1 and quarter 2 groundwater monitoring events for respective wells. With the exception of groundwater monitoring well M236W, the relative percent difference between the quarter 1 and quarter 2 primary sample results for each respective well was within 30% (most were within 10%). The relative percent difference between the quarter 1 and quarter 2 samples from M236W was somewhat higher at 77%, which is attributed to the low concentration of bicarbonate in the samples from these wells (i.e. a small difference in concentration creates a relatively large relative percent difference).

Sulfate

Sulphate primary sample analytical results showed concentrations that ranged from 4 mg/L to 1,560 mg/L, and averaged 413 mg/L. Approximately half the results, 37 of 61 samples collected, exceeded the interim trigger levels.

Concentrations of sulphate varied significantly from well cluster to well cluster. In most cases the results within well clusters were similar in range, although there were a few clusters that contained one or two wells with results that were significantly different from that of the other wells (Dam 2). The lowest sulphate concentrations were present in the samples from groundwater monitoring wells clusters around Dam 3 (M235W, M236W, M237W), Dam 4 (M238W, M239W, M240W), and Dam 9 (M250W, M252W).

The values tended to be consistent between the quarter 1 and quarter 2 groundwater monitoring events for respective groundwater monitoring wells. For most of the wells, the relative percent difference between the quarter 1 and quarter 2 primary sample results was within 30%. Noted exceptions to this include M247W and M248W, which showed a relative percent difference between the quarter 1 and quarter 2 monitoring events at 138% and 264%, respectively.

Chloride

Chloride primary sample analytical results showed concentrations that ranged from 131 mg/L to 18,500 mg/L, and averaged 6,390 mg/L. Nearly all of the results, with the exception of those from the samples collected from M232W, exceeded the interim trigger levels.

Concentrations of chloride varied significantly from well cluster to well cluster, but were generally within an order of magnitude within well clusters. The highest chloride levels were present in samples from the wells clustered around Dams 1 and 10, Dam 2, Dam 7, and Dam 11.

The values tended to be consistent between the quarter 1 and quarter 2 groundwater monitoring events. With the exception of groundwater monitoring well M237W, the relative percent difference between the quarter 1 and quarter 2 primary sample results for each respective well was within 30% (most were within 10%). The relative percent difference between the quarter 1 and quarter 2 samples from M237W was 79%.

Calcium, magnesium, and sodium

Calcium primary sample analytical results showed concentrations that ranged from 12 mg/L to 1,230 mg/L, and averaged 2,790 mg/L. Magnesium concentrations ranged from 2 mg/L to 2,100 mg/L, and averaged 485 mg/L. Sodium concentrations ranged from 106 mg/L to 11,000 mg/L, and averaged 3,453 mg/L. Most of the results exceeded respective interim trigger values.

Concentrations of calcium, magnesium, and sodium tended to vary from well to well, even within well clusters. The highest concentrations tended to occur in the clustered around Dams 1 and 10, Dam 7, and Dam 11.

The values tended to be consistent between the quarter 1 and quarter 2 groundwater monitoring events. With the noted exception of groundwater monitoring well M237W, the relative percent difference between the quarter 1 and quarter 2 primary sample results for each respective well was generally within 30% (most were within 10%). The relative percent

difference between the quarter 1 and quarter 2 samples from M237W was 80%, 81%, and 66% for calcium, magnesium, and sodium, respectively.

Hydrocarbons

Total petroleum hydrocarbons and total recoverable hydrocarbons were reported at levels marginally above the level of reporting (LOR) in the quarter 1 sample from M244W, but were below laboratory LOR in the quarter 2 sample. There are no interim trigger levels for total petroleum hydrocarbons. Based on the low concentrations reported during quarter 1 and the non-detect results from quarter 2, the hydrocarbons detected are not considered to be a concern; however, ongoing monitoring will be undertaken.

7 ANALYSIS AND INTERPRETATION

The data shows that cation and anion concentrations, EC and TDS levels, and pH exhibit a high level of variability by location. This is shown by the markedly different results in levels of these parameters between dam locations (i.e. markedly different results between different areas of PL191). In addition, although these parameters tend to occur at similar levels within groups (or clusters) of relatively closely-spaced wells, this is not always the case. Notably, the well clusters around Dam 2, Dam 3, and Dam 4 each have at least 1 "outlier" well with markedly lower results for most of the interim trigger level parameters, particularly EC, TDS, and chloride.

The tendency of wells within closely spaced groups to exhibit similar levels of pH, EC, TDS, cations, and anions indicates that the levels observed are representative of background conditions, and that the high level of variability observed between areas is also attributed to naturally-occurring conditions. In addition, where "outlier" results have occurred within a well cluster, the results tend to be much lower than that of the surrounding wells. This suggests that even where localised variability is observed, the variability is attributed to naturally-occurring conditions.

Although there is a high level of variability by location, the analytical data does shows a relatively high level of consistency between the quarter 1 and quarter 2 groundwater monitoring events for respective wells. As discussed in **Section 6**, the relative percent difference between the quarter 1 and quarter 2 groundwater monitoring events for most of the interim trigger level parameters was within about 30% (many within a much lower percentage), with a mix of slightly higher and slightly lower results from quarter 1 to quarter 2. The well exhibiting the highest level of variability was M237W, which showed modest decreases in EC, TDS, cation, and anion (except bicarbonate) levels ranging from 66% to 80% between quarter 1 and quarter 2. Two wells, M247W and M248W, showed significant increases in bicarbonate between the quarter 1 and quarter 2 groundwater monitoring events, although there was little change in the other interim trigger level parameters for these wells. There were no substantial differences noted between the quarter 1 and quarter 2 groundwater monitoring event results for the interim trigger level parameters that indicate a significant change in groundwater chemistry consistent with a release of CSG water.

Although the results show that the majority of samples exceeded the majority of the interim trigger levels, this is not necessarily indicative of a release of CSG water from any of the dams on PL191. In fact, the data indicates that the interim trigger levels with respect to most, if not

all of the parameters, are significantly lower than that which is representative of background water quality in most areas of PL191. In addition, background groundwater quality on PL191 varies significantly by area, and appears to have very localised variations. The interim trigger levels will need to be adjusted to reflect background groundwater quality, including the variations in water quality that has been observed. This will be completed after the completion of four consecutive quarters of groundwater monitoring, with on-going corrections applied as required.

There were six groundwater monitoring wells (M330W, M331W, M332W, M253W, M254W, M255W) that were dry during both the quarter 1 and quarter 2 groundwater monitoring events. As no groundwater was encountered during the installation of these wells, these wells were screened to intercept water should leakage of CSG water from an adjacent dam and accumulation of water in the subsurface occur (note that these wells would also potentially capture groundwater, should an ephemeral shallow groundwater condition occur). As all of these wells have remained dry, there is no indication of leakage from their respective dams. In addition, groundwater monitoring well M251W contained water during the quarter 1 groundwater monitoring event, but was dry during quarter 2.

The use of trigger levels is not a reliable method for screening groundwater to determine whether a release of CSG water has potentially occurred. To make such a determination, further analysis is necessary. One method for assessing whether groundwater has been potentially impacted by CSG water is through a graphical representation and comparison of groundwater quality for major ionic species using Piper Diagrams (Fetter, 1994). These can be used to form a "fingerprint" with respect to major ion types in various sources of water. This analysis is discussed below.

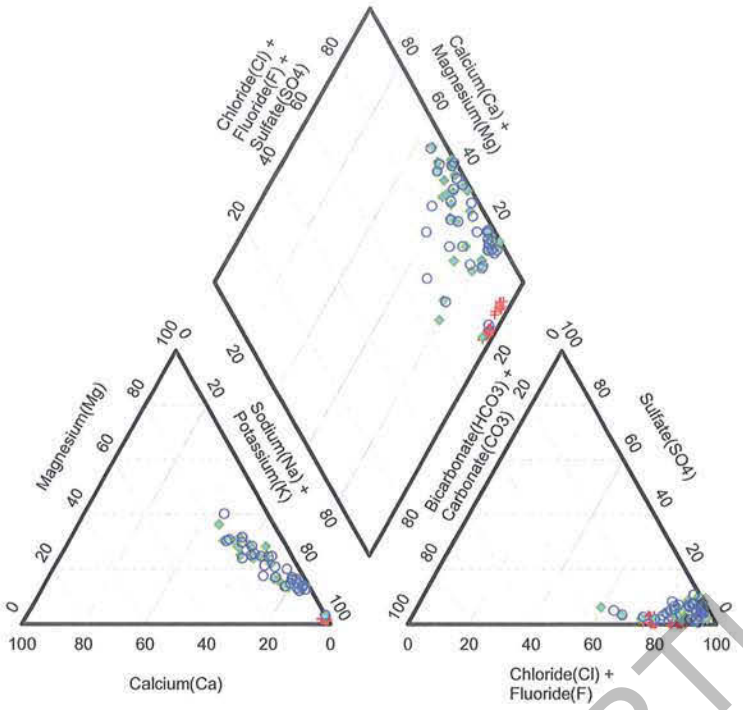
Figure 7-1 is a Piper Diagram showing the quarter 1 and quarter 2 groundwater quality results along with six months of water quality results from Dams 1, 2, 5, 10, and 11 (from March 2012 to August 2012). These water quality results from Dams 1, 2, 3, 10, and 10 are provided in **Table 2**. Most of the groundwater results cluster within the Cl-SO_4 and Na-K-Cl-SO_4 hydrochemical facies types. There are two outliers, M232W quarter 1 and quarter 2 monitoring results, which fall within the Na+K facies type. Dam water is also closely clustered within the Na+K facies type. With the exception of the M232W results, this plot shows a distinct separation between groundwater and dam water, which demonstrates that the profile of major ions in quality in groundwater in nearly all of the areas monitored is distinguishable from that of dam water.

A more detailed Piper Diagram showing the groundwater monitoring results from individual wells around Dam 2 (including M232W) as well as the Dam 2 water results is shown in **Figure** 7-2. Although the groundwater from M232W is within the same hydrochemical facies as the Dam 2 water, this diagram also shows that the groundwater from the remaining wells around Dam 2 (M233W, M234W, M235W) falls within the same area of the diagram as that of the Dam 2 water results (i.e. skewed towards the right corner of the diamond field). In addition, the groundwater in this area plots in a manner such that it is clustered around the Dam 2 water plots. This indicates that the groundwater in the vicinity of Dam 2 happens to be similar with respect to distribution of major ions as that of the water stored in Dam 2.

In addition, the levels of EC, TDS, and anions in both the quarter 1 and quarter 2 samples from M232W are much lower than the levels present in the Dam 2 water. Therefore, it is unlikely that the differences between groundwater at M232W and groundwater at the remaining wells

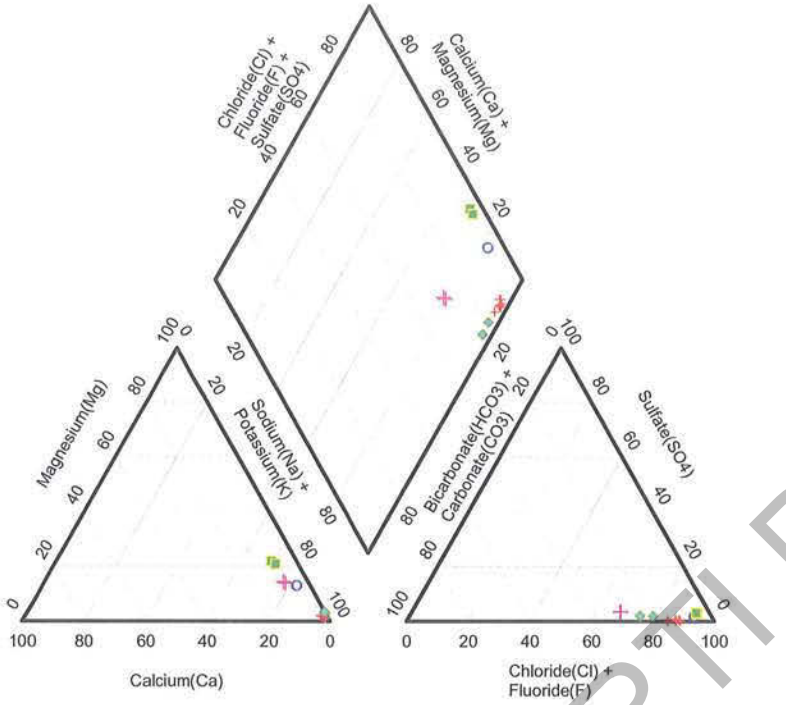
that are clustered around Dam 2 is attributed impact by CSG water. Rather, these differences in concentration are likely attributed to naturally-occurring variability.

Figure 7-1 Piper diagram showing Q1 and Q2 groundwater and March 2012 to August 2012 water quality results for major cations and anions



- Groundwater quality results, quarter 1 2012
- Groundwater quality results, quarter 2 2012
- Dam water quality results (dams 1, 2, 5, 10, & 11), March 2012 to August 2012

Figure 7-2 Piper diagram showing Q1 and Q2 groundwater and March 2012 to August 2012 water quality results for major cations and anions (Dam 2 and individual surrounding wells)



- M232W groundwater quality results, quarters 1 and 2 2012
- M233W groundwater quality results, quarters 1and 2 2012
- M234W groundwater quality results, quarters 1 and 2 2012
- M235W groundwater quality results, quarters 1 and 2 2012
- Dam water quality results (dam 2), March 2012 to August 2012

Given the high level of variability in groundwater quality in different areas of PL191, general trigger levels for groundwater across the entire tenement based on aggregate background groundwater quality will not likely be feasible, even with four consecutive quarters of monitoring. The development of *location-specific* trigger levels based on multiple iterations of groundwater monitoring may provide a somewhat more reliable threshold for determining whether impact to groundwater due to a release of CSG water may be present. However, even with the development of trigger levels in this manner, there may be some issues related to long-term fluctuations such as fluctuating periods of drought and non-drought. An understanding of how these factors may affect groundwater quality may require long-term monitoring significantly beyond four consecutive quarters. In the interim, comparative analysis of the water chemistry signatures may be a more reliable indicator than comparison to threshold concentrations. Further evaluation of these issues will be completed as the GMP progresses.

8 CONCLUSIONS

Based on review of the groundwater monitoring completed in the vicinity of regulated dams on PL191, there was no evidence noted indicating impact to or a change in groundwater quality associated with the storage of CSG water in regulated dams.

The above conclusion is contingent upon confirmation that the results provided by Worley Parson meet an acceptable quality standard and are deemed suitable for interpretive use (as noted in the preceding, a quality assurance/quality control review and report are pending for these results).

9 REFERENCE DOCUMENTS

Arrow Energy/CH4 and other documents referenced in this procedure are listed in **Table 9-1**.

Table 9-1 Reference documents

Document Number	Document Title
PEN100015907	Level 1 Environmental Authority (petroleum activities) (GMP) (Arrow Energy, 03-V-PL-2017) developed pursuant to Level 1 Environmental Authority (EA) PEN100015907
03-V-REP-0009	Petroleum Activities Groundwater Risk Assessment PL191, 196, [illegible] 73 and PPL115, 116
03-V-PL-2017	Groundwater Monitoring Program: Petroleum Lease (PL) 191 and 196

TABLES

WorleyParsons
resources & energy

TABLE 1 Groundwater monitoring results PL191 (quarter 1 and quarter 2)

Dam Number	Monitoring Well ID	Sample Name	Date	QA/QC Sample Type	Laboratory Work Order Number	Sampling Quarter	Physical Parameters (Field Measured): pH	Electrical Conductivity	Temperature	Dissolved Oxygen	Redox Potential	Turbidity	Physical Parameters (Laboratory Measured): Electrical Conductivity @ 25°C	Total Dissolved Solids @180°C	Major Anions: Hydroxide Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$	Bicarbonate Alkalinity as $CaCO_3$	Total Alkalinity as $CaCO_3$	Sulfate as SO_4	Chloride	Major Cations: Calcium	Magnesium	Sodium	Potassium
			(d-m-y)				(pH Units)	(µS/cm)	(°C)	(mg/L)	(mV)	(NTU)	(µS/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Interim Trigger Levels (03-V-PL-2017)							6.0 - 8.5	2150					2150	4000			536		140	175	84	108	115	
Dam 1 and 10	M225W	M225W	20-Feb-2012	---	EB1205042	Q1 - 2012	6.56	18710	29.6	1.55	55.9	0.0	30000	20000	<1	<1	827	827	885	10500	146	537	6330	94
		M225W	06-Jun-2012	---	EB1215607	Q2 - 2012	6.67	22700	27.1	20	193.3	0.0	26000	19900	<1	<1	799	799	689	10400	140	524	6660	96
	M226W	M226W	19-Feb-2012	---	EB1204814	Q1 - 2012	6.54	41070	32.6	1.55	-45.6	0.0	42700	31600	<1	<1	749	749	771	18500	328	699	9650	105
		M226W	17-Jun-2012	---	EB1216150	Q2 - 2012	6.65	26900	24.5	1.6	207.2	0.0	44900	33500	<1	<1	759	759	930	18400	284	924	9650	123
	M227W	M227W	19-Feb-2012	---	EB1204814	Q1 - 2012	6.40	19170	31.6	0.74	-122.6	0.0	26400	19600	<1	<1	737	737	498	9680	169	510	6300	55
		M227W	16-Jun-2012	---	EB1216150	Q2 - 2012	6.49	33930	26.7	0.16	156.3	0.0	28000	20600	<1	<1	740	740	639	9360	155	533	6200	63
	M228W	M228W	19-Feb-2012	---	EB1204814	Q1 - 2012	6.83	37340	31.5	3.16	95.8	57.4	38500	26900	<1	<1	537	537	773	14000	417	919	8340	85
		M228W	16-Jun-2012	---	EB1216150	Q2 - 2012	6.70	27090	27.1	0.44	151.1	---	38500	27600	<1	<1	625	625	924	13200	376	855	7860	95
	M229W	M229W	20-Feb-2012	---	EB1205042	Q1 - 2012	6.54	39180	29.2	0.79	-134.1	430.0	45900	37100	<1	<1	622	622	665	16100	392	854	9600	138
		M229W	16-Jun-2012	---	EB1216150	Q2 - 2012	6.70	36910	26.4	2.21	176.1	213.0	46400	34600	<1	<1	620	620	962	16600	427	1120	9780	143
	M230W	M230W	28-Feb-2012	---	EB1205832	Q1 - 2012	6.83	5657	28.4	0.1	-269.6	0.0	5840	3210	<1	<1	446	446	95	1450	59	100	1110	15
		M230W	15-Jun-2012	---	EB1216150	Q2 - 2012	7.13	4859	26.5	0.27	-79.0	0.0	5430	3010	<1	<1	411	411	95	1400	60	98	882	19
Dam 2	M231W	M231W	18-Feb-2012	---	EB1204814	Q1 - 2012	6.14	48900	27.8	1.36	-68.7	0.0	48600	44200	<1	<1	466	466	1540	16500	792	2100	9090	86
		M231W	12-Jun-2012	---	EB1215715	Q2 - 2012	6.78	23080	23.5	0.21	1023.0	0.0	33200	28700	<1	<1	572	572	1120	13000	560	1310	6820	68
		Dam2	12-Jun-2012	DUPLICATE	EB1215715	Q2 - 2012	6.78	23080	23.5	0.21	1023.0	0.0	33000	26700	<1	<1	568	568	1130	12900	560	1130	5890	67
		M231WT	12-Jun-2012	TRIPLICATE	341304-W	Q2 - 2012	6.78	23080	23.5	0.21	1023.0	0.0	38000	23000	---	---	---	420	1200	14000	680	1400	6800	57
	M232W	M232W	18-Feb-2012	---	EB1204814	Q1 - 2012	5.80	594	26.9	2.27	206.0	59.9	585	494	<1	<1	75	75	5	141	<1	2	119	2
		M232W	12-Jun-2012	---	EB1215715	Q2 - 2012	5.71	430	26	1.45	183.3	---	503	424	<1	<1	54	54	4	131	<1	2	106	2
	M233W	M233W	18-Feb-2012	---	EB1204814	Q1 - 2012	6.36	11000	26.8	1.25	181.4	159.0	11400	6930	<1	<1	407	407	82	3970	101	178	2120	15
		M233W	12-Jun-2012	---	EB1215715	Q2 - 2012	6.27	9127	25.8	0.11	169.6	0.0	10000	7020	<1	<1	410	410	101	3900	93	178	2140	18
	M234W	M234W	18-Feb-2012	---	EB1204814	Q1 - 2012	6.63	17470	27.7	3.86	2.6	37.6	18000	13200	<1	<1	488	488	246	6310	266	470	2820	4
		M234W	12-Jun-2012	---	EB1215715	Q2 - 2012	6.69	15520	25.9	4.09	164.2	0.0	16900	12900	<1	<1	510	510	200	6360	273	470	3040	6
Dam 3	M235W	M235W	03-Mar-2012	---	EB1206458	Q1 - 2012	6.91	6400	30.2	0.03	-256.1	0.0	6550	4500	<1	<1	1050	1050	92	1420	101	108	1100	10
		M235W	10-Jun-2012	---	EB1215607	Q2 - 2012	6.77	6085	24.7	0.27	-118.1	74.0	6290	3830	<1	<1	1070	1070	100	1470	97	105	1130	8
	M236W	M236W	03-Mar-2012	---	EB1206458	Q1 - 2012	5.87	1705	28.3	2.91	183.4	415.0	1910	1200	<1	<1	93	93	26	549	41	62	238	1
		M236W	11-Jun-2012	---	EB1215607	Q2 - 2012	6.00	1504	26.2	1.33	194.3	977.0	1830	1050	<1	<1	165	165	26	498	46	61	218	1
	M237W	M237W	03-Mar-2012	---	EB1206458	Q1 - 2012	6.19	11700	29.8	1.23	34.8	76.8	11400	8240	<1	<1	338	338	114	3870	412	517	1230	3
		M237W	10-Jun-2012	---	EB1215607	Q2 - 2012	6.73	2875	27.7	2.51	153.5	770.0	3230	1700	<1	<1	408	408	38	799	84	100	418	1
Dam 4	M238W	M238W	02-Mar-2012	---	EB1206458	Q1 - 2012	7.09	14690	31.4	3.12	158.6	496.0	13900	9550	<1	<1	487	487	67	4160	273	400	1660	9
		M238W	09-Jun-2012	---	EB1215607	Q2 - 2012	6.97	10770	25	0.37	75.9	19.0	13900	9610	<1	<1	516	516	46	5000	320	500	2000	11
	M239W	M239W	02-Mar-2012	---	EB1206458	Q1 - 2012	6.45	4522	28.3	2.37	157.4	0.0	4050	2270	<1	<1	267	267	48	1100	68	76	658	6
		M239W	10-Jun-2012	---	EB1215607	Q2 - 2012	6.43	2802	26.2	2.99	160.7	0.0	3340	1950	<1	<1	248	248	32	930	58	65	530	6
		M239WD	10-Jun-2012	DUPLICATE	EB1215607	Q2 - 2012	6.43	2802	26.2	2.99	160.7	0.0	3240	2150	<1	<1	247	247	31	843	59	66	543	6
	M240W	M240W	02-Mar-2012	---	EB1206458	Q1 - 2012	6.90	1395	28.1	2.57	125.1	469.0	1330	830	<1	<1	269	269	39	274	17	21	234	2
		M240W	10-Jun-2012	---	EB1215607	Q2 - 2012	6.33	1030	25	2.19	172.2	---	1200	755	<1	<1	222	222	29	272	25	31	185	3
Dam 5	M241W	M241W	15-Feb-2012	---	EB1204814	Q1 - 2012	5.73	10780	30.4	---	223.0	19.9	9710	6210	<1	<1	744	744	207	3060	212	300	1480	9
		M241W	10-Jun-2012	---	EB1215607	Q2 - 2012	6.82	8702	25.3	5.7	161.5	0.0	10000	6270	<1	<1	783	783	266	3130	205	310	1520	11
	M242W	M242W	28-Feb-2012	---	EB1205832	Q1 - 2012	7.11	15550	28.1	0.55	-192.6	247.0	15100	8900	<1	<1	1050	1050	402	4700	63	262	2030	4
		M242W	11-Jun-2012	---	EB1215607	Q2 - 2012	7.23	12060	25.5	0.33	129.3	13.2	14900	9170	<1	<1	1060	1060	421	4730	54	255	2880	4
	M243W	M243W	28-Feb-2012	---	EB1205832	Q1 - 2012	7.03	7955	30.1	2.46	196.3	0.0	8460	4750	<1	<1	861	861	67	2150	168	171	1450	2
		M243W	11-Jun-2012	---	EB1215607	Q2 - 2012	6.80	6130	24.8	1.57	107.6	0.0	6400	3520	<1	<1	639	639	44	1730	162	138	1010	2
Dam 6	M244W	M244W	01-Mar-2012	---	EB1205944	Q1 - 2012	6.20	9271	28.1	0.71	86.1	0.0	7800	5840	<1	<1	490	490	250	2640	234	265	1270	17
		M244W	15-Jun-2012	---	EB1216150	Q2 - 2012	6.25	7446	26.6	0.23	86.6	0.0	8540	5420	<1	<1	474	474	309	2670	220	258	1190	17
	M245W	M245W	01-Mar-2012	---	EB1205944	Q1 - 2012	6.35	16270	27.9	2.23	169.0	0.0	13800	13100	<1	<1	588	588	485	5280	640	624	1840	22
		M245W	15-Jun-2012	---	EB1216150	Q2 - 2012	6.57	12660	26.6	0.23	131.4	0.0	15300	12400	<1	<1	563	563	541	5130	596	601	1910	21
	M246W	M246W	01-Mar-2012	---	EB1205944	Q1 - 2012	6.60	12690	28.2	3.64	163.1	0.0	11600	9980	<1	<1	604	604	420	4320	449	494	1820	17
		DAM 6	01-Mar-2012	DUPLICATE	EB1205944	Q1 - 2012	6.60	12690	28.2	3.64	163.1	0.0	11700	9920	<1	<1	616	616	416	4250	439	478	1800	16
		M246WT	01-Mar-2012	TRIPLICATE	235043-W	Q1 - 2012	6.60	12690	28.2	3.64	163.1	0.0	14000	7700	---	<10	610	---	150	4100	380	420	1700	14
		M246W	15-Jun-2012	---	EB1216150	Q2 - 2012	6.37	13040	27.6	0.1	65.1	0.0	15000	10600	<1	<1	547	547	494	5100	624	907	1930	19
		DAM 6	15-Jun-2012	DUPLICATE	EB1216150	Q2 - 2012	6.37	13040	27.6	0.1	65.1	0.0	15300	11300	<1	<1	558	558	491	5100	627	610	1930	19
		M246WT	15-Jun-2012	TRIPLICATE	341401-W	Q2 - 2012	6.37	13040	27.6	0.1	65.1	0.0	15000	11000	---	---	---	520	460	4800	650	740	2300	17
Dam 7	M247W	M247W	29-Feb-2012	---	EB1205944	Q1 - 2012	6.58	18260	29.5	0.87	125.4	38.0	17200	13100	<1	<1	1290	1290	344	6020	327	624	3160	9
		M247W	13-Jun-2012	---	EB1215950	Q2 - 2012	6.70	16770	26.7	0.13	135.2	0.0	16500	13000	<1	<1	1280	1200	619	6010	307	608	3140	10
	M248W	M248W	29-Feb-2012	---	EB1205944	Q1 - 2012	6.21	42640	28.9	1.52	-175.9	554.0	35800	36100	<1	<1	552	552	429	15000	1230	1440	7080	23
		M248W	13-Jun-2012	---	EB1215950	Q2 - 2012	6.26	35830	26.7	0.07	-71.3	885.0	37300	36000	<1	<1	561	561	1660	16700	1200	1600	7360	26
	M249W	M249W	01-Mar-2012	---	EB1206458	Q1 - 2012	6.05	23860	28.6	0.89	-85.1	0.0	33400	26800	<1	<1	542	542	620	11600	1200	1130	4910	25
		M249W	13-Jun-2012	---	EB1215950	Q2 - 2012	6.15	24220	27.1	0.02	15.0	0.0	26500	30900	<1	<1	548	548	672	11400	1200	1070	4980	30
Dam 9	M250W	M250W	29-Mar-2012	---	EB1208901	Q1 - 2012	6.11	2640	29.6	6.85	191.3	58.4	2430	1340	<1	<1	65	65	88	659	16	41	436	11
		DAM 9a	29-Mar-2012	DUPLICATE	EB1208901	Q1 - 2012	6.11	2640	29.6	6.85	191.3	58.4	2440	1370	<1	<1	64	64	88	722	16	2	446	12
		M250W	14-Jun-2012	---	EB1216141	Q2 - 2012	5.40	2055	26.3	1.52	263.3	---	2440	1330	<1	<1	58	58	78	700	15	42	431	10
	M251W	M251W	03-Mar-2012	---	EB1206458	Q1 - 2012	4.90	6510	20	2.03	196.6	0.0	6570	3760	<1	<1	10	10	279	1900	12	104	1170	36
	M252W	M252W	03-Mar-2012	---	EB1206458	Q1 - 2012	5.93	2766	28.2	2.77	180.8	340.0	2810	1630	<1	<1	52	52	89	776	14	51	487	12
		DAM 9	03-Mar-2012	DUPLICATE	EB1206458	Q1 - 2012	5.93	2766	28.2	2.77	180.8	340.0	2810	1600	<1	<1	52	52	88	770	14	50	493	12
		M252W	14-Jun-2012	---	EB1216141	Q2 - 2012	5.51	2377	26.6	2.4	255.1	0.0	2810	1530	<1	<1	56	56	92	806	15	53	464	12
			14-Jun-2012	DUPLICATE	EB1216141	Q2 - 2012	5.51	2377	26.6	2.4	255.1	0.0	2600	1520	<1	<1	55	55	93	804	15	53	468	12
Dam 11	M329W	M329W	04-Mar-2012	---	EB1206458	Q1 - 2012	6.52	40660	28.4	0.65	25.5	0.0	45300	21000	<1	<1	613	613	1000	17400	101	803	10400	137
			09-Jun-2012	---	EB1215607	Q2 - 2012	6.58	37810	26.4	1.55	94.3	350.0	45000	32100	<1	<1	664	664	778	17000	160	840	11000	124
	M339W	M339W	04-Mar-2012	---	EB1206458	Q1 - 2012	7.21	37640	33.3	2.34	163.7	0.0	37400	25300	<1	<1	666	666	1130	13800	155	725	8630	129
		M339W	11-Jun-2012	---	EB1215607	Q2 - 2012	6.43	24950	27.1	0.72	161.0	0.0	37700	26500	<1	<1	679	679	970	13500	145	706	8910	120
		DAM 11	04-Mar-2012	DUPLICATE	EB1206458	Q1 - 2012	7.21	37640	33.3	2.34	169.7	0.0	37300	25400	<1	<1	651	651	1150	14000	161	705	8560	125
		M339WT	07-Mar-2012	TRIPLICATE	329559-W	Q1 - 2012	7.21	37640	33.3	2.34	169.7	0.0	42000	26000	---	<10	640	---	340	15000	150	720	8200	91
	M340W	M340W	05-Mar-2012	---	EB1206458	Q1 - 2012	6.66	11320	29.4	2.88	138.7	0.0	11800	7110	<1	<1	681	681	382	3520	93	175	2060	31
		M340W	13-Jun-2012	---	EB1215950	Q2 - 2012	6.60	8352	26.1	0.16	85.1	0.0	9120	5840	<1	<1	652	652	332	3090	75	145	1870	33

NOTES:
(green shading) *Exceedance of Interim Trigger Levels*

Document Number: ENV12-220

Arrow Energy Annual Return Submission

Environmental Protection Act 1994 – Section 316A: Particular requirement for annual return for CSG environmental authority

This section refers to Section316A – *Particular Requirement for Annual Return for CSG Environmental Authority* of the Environmental Protection Act 1994. Particularly the annual return must include an evaluation of the effectiveness of the management of coal seam gas water. This evaluation provides a description of the criteria mentioned in section 310D (5)(e) and details on the effectiveness of management of coal seam gas water in regard to the criteria.

Table 1 below outlines the objectives, environmental values to be protected and an evaluation of performance against measureable criteria for the management of CSG water.

In addition to Table 1 and in accordance requirements detailed in EA Condition (G15), due to the CSG water from PL191 and PL196 being currently stored within dams on PL191, and no water release occurring during the period of this annual return, a Release Reduction Strategy to maximise CSG water use is not applicable at this time.

Table 1 - Measurable Criteria for Key CSG Water Activities

Objectives	Environmental value to be protected	Task / Action	Key Performance Indicators	Evaluation of Performance (PL224)
Transmission of CSG water via pipelines				
• Effective containment of water throughout transmission activities (i.e. from source to point of storage)	• Surface and groundwater quality to sustain surrounding ecological values	• Monitoring in accordance with relevant procedures and programs (including groundwater monitoring program and field infrastructure inspections and audits) • Regular infrastructure maintenance in accordance with set programs and schedules • Effective planning and clearance activities to site flow lines in areas of low impact and in accordance with EA conditions	• Recommendations for any repairs are addressed and closed out in a timely manner. • EA requirements are met	Transmission of CSG water via pipelines has been effectively managed and environmental values protected through: • Program of maintenance and inspections developed to limit failure of equipment • Continued use of CSG water spill management procedure/manual • Construction of transmission lines preferentially located adjacent to existing infrastructure (where practicable)
Storage of untreated and treated **CSG water** in dams				
• Effective storage and containment of CSG water • EA Conditions are complied with.	• Groundwater quality	• Conduct third party dam inspections (annually) • Monitoring in accordance with relevant procedures and programs (including the groundwater monitoring program) • Maintenance of infrastructure and facilities necessary to effectively contain water	• Records indicate regular inspections and maintenance as per planned schedules • Relevant EA conditions are met • Recommendations for repairs are actioned appropriately.	Storage of untreated CSG water in dams on PL191 has been adequately managed through the following: • Annual inspections are undertaken • Surface water and groundwater quality sampling undertaken to characterise and assess changes to baseline water quality. • Routine storage capacity assessments to ensure water levels are managed appropriately.
Beneficial use				
• Assess potential uses for CSG water	• No off-takes are currently utilised	• No off-takes are currently utilised	• TBA (no off-takes are currently utilised)	• Water produced on PL191 and PL196 is currently stored. • A Reverse Osmosis water treatment facility is currently being constructed on PL191, which will be utilised for water produced on PL191 and PL196, once commissioned.

Objectives	Environmental value to be protected	Task / Action	Key Performance Indicators	Evaluation of Performance (PL224)
				• Beneficial use options are currently being considered
Management and disposal of any wastes (including brine and salt)				
• Not currently applicable to PL191 and PL196	• Not currently applicable to PL191 and PL196	• Not currently applicable to PL191 and PL196	• Not currently applicable to PL191 and PL196	Not currently applicable to PL191 and PL196

Should any of the above criteria not be met, actions to enable the criteria to be satisfied in future include:

- evaluation (including route cause analysis) of the underlying cause of the criteria not being met;
- implementation of corrective actions to address underlying cause (including engineering solutions and amendments to plans and procedures as required);
- review of relevant procedures, protocols and management plans to determine actions necessary to prevent further non conformance; and
- implementation of training and awareness programs to prevent further non conformance.

CH4 Operations Pty Ltd

arrow energy
go further

14 February 2013

Our Ref: PEN100015907 PL191/196
Your Ref: BNE36595/PEN100015907

John Frankish
Manager, Energy Assessment Unit
Department of Environment and Heritage Protection
GPO Box 2454
Brisbane QLD 4001

Dear John

Subject: Response to Annual Return Assessment and 3rd Party Audit

I refer to your letters dated 16th January and 8th February 2013 regarding the Annual Return for EA PEN100015907 and additional information required by the EHP.

In relation to monitoring information that is required for the Annual Review, please note the following:

- No contaminants were released to the Isaac River throughout the reporting period. Therefore there are no monitoring data available for this.

[redacted]

Arrow engaged consultants Gilbert and Sutherland to conduct a 3rd Party Audit of the following EAs:

- PEN100015907 for PL191, PL196, and PPL115

[redacted]

The audit was conducted between 20 and 22 November 2012, and the resulting report submitted to Arrow in December 2012. An Action Plan has been developed for all Non-Compliances and is submitted with this letter for your referral. Please note that whilst Partial Non-Compliances were not included in this Action Plan, they are being addressed by Arrow Energy through our current Environment Improvement Plan. Should the EHP require a copy of the full audit report, Arrow Energy will be able to supply an electronic copy for your reference.

Regards,

s73 [redacted]

Production Manager (North)
Arrow Energy Pty Ltd

arrow energy
go further

ENVIRONMENTAL ACTION PLAN

Report on actions to address non compliant findings identified in November 2012 Third Party Audit of Environmental Authorities for Petroleum Leases:

PL 191/196 & PPL 115 (PEN 100015907)

s.73 s.73

ARROW ENERGY PTY LTD
MORANBAH QLD

February 2013

Table of Contents

1 Introduction

Arrow Energy Pty Ltd (Arrow) is the parent company of CH4 Pty Ltd (CH4). References to Arrow Energy in this Environmental Action Plan should be taken to mean references to CH4.

In November 2012, Gilbert and Sutherland completed a third party Environmental Authority (EA) Compliance Audit in accordance with the provisions of the EA.

The Environmental Authorities that were audited were:

Environmental Authority	Tenement Covered	Effective Date	Anniversary Date
PEN100015907	PL191, PL196, PPL115, PPL116	12th January 2012	1st October
s73			

Arrow Energy has prepared this Action Plan in accordance with EA Condition (A19) of each of the above-listed EAs.

This report should be read in conjunction with the Gilbert and Sutherland audit report entitled "Third Party Audit 2011-2012 Moranbah Gas Project Queensland" dated December 2012.

Sections of the Environmental Authorities for PL191/196 (PEN10015907), [redacted] that are relevant to the purpose of this Environmental Action Plan include:

(A18) The holder of this environmental authority must immediately act upon any recommendations arising from this audit report by:

(a) Investigating any non-compliance issues identified; and

(b) As soon as practicable, implementing measures or taking necessary action to ensure compliance with the requirements of this environmental authority

(A19) Subject to Condition A18, and not more than three months following the submission of the audit report, the holder of this environmental authority must provide a written report to the administering authority addressing the:

(a) Actions taken by the holder of this environmental authority to ensure compliance with this environmental authority; and

(b) Actions taken to prevent a recurrence of any non-compliance issues identified.

At the time the audit was completed, Arrow and the Queensland Department of Environment and Heritage Protection (EHP) were in the process of negotiating a transitional environmental program (TEP) relating to each of the above listed EAs. The TEP addresses non compliances in the areas of chemical storage, erosion and sediment control, and air emissions monitoring. This TEP was since approved by EHP on 30 January 2013, and is referenced as MAN16300.

As the TEP was a draft document at the time of the audit, the audit findings do not consider the proposed commitments in the TEP, with the exception that the draft TEP was mentioned in various sections of the audit report. Therefore, the audit findings and recommendations do not necessarily reflect areas of non compliance which are now being managed under the TEP. Findings in the audit relating to chemical storage, erosion and sediment control, and air emissions monitoring will be addressed pursuant to the TEP.

2 Objective and Scope

The objective of this Environmental Action Plan is to identify actions being planned or undertaken to address the non-compliances as detailed in the Gilbert and Sutherland third party audit of Arrow (North) Environmental Authorities (EA). Whilst this Action Plan only refers to non compliance issues identified, Arrow is also addressing the partial non compliances.

3 Environmental actions to address non-compliance issues

In the following sections, the third party auditor's comments for each non compliant finding are quoted in *italics*, and are followed by Arrow's response to the finding and comments. Arrow's response includes a summary of the actions undertaken and/or to be undertaken, where applicable. For ease of reference, in presenting the following sections Arrow has followed the same numbering and headings as presented in the auditor's report.

3.1 Schedule A – General Conditions

3.1.1 Condition A9: Operational Plan

Applicable to:

- *PEN100015907 – A9*

s.73

Condition A9 requires that revised Operational Plans be submitted to the administering authority not less than three months prior to the expiry of the current plan.

The current Operational Plans were not submitted within the required timeframe.

It is recommended that future Plans be submitted within the stipulated timeframe.

Arrow is currently developing a process to improve tracking and management of documents required under Environmental Authorities, including Operational Plans. The process will include early identification of plans that are coming due to help ensure that they are completed and submitted within required timeframes.

Arrow is also undertaking a review of its Operational Plans for PEN100015907 and As part of this review, amended Operational Plans will be prepared, which will include further details relating to proposed sites of disturbance and progressive rehabilitation.

Note that for proposed infrastructure and sites of disturbance, Arrow cannot disclose specific information until land access and compensation agreements are executed and locations are finalised (per landholder agreements). In the amended Operations Plans, Arrow will provide further details relating to proposed disturbance from "approved" infrastructure, but cannot provide details relating to proposed disturbances for infrastructure that has not been approved. These aspects have been discussed at length with DEHP and the content has previously been confirmed as acceptable.

Whilst Arrow has conducted progressive rehabilitation of sites of disturbance on the above-listed tenements, monitoring is required to confirm the rehabilitation status of each site. To address this, Arrow will also implement a rehabilitation monitoring program to assess, confirm, and formally document the status of each area of disturbance in relation to the progressive rehabilitation requirements specified by applicable environmental authority conditions (refer to Schedule H of PEN100015907 This monitoring program will provide information relating to progressive rehabilitation as necessary to meet the progressive rehabilitation information requirements of relevant sub-conditions of condition A7.

In July 2012, CH4 submitted an amendment application for these Environmental Authorities, which, among other changes, proposes to consolidate them into one permit, enabling the area to operate as a single, integrated operation. This amendment application is still under review by EHP. In anticipation that these Environmental Authorities would be consolidated into one permit, the calculation of financial assurance for each of these was combined. The calculation of financial assurance for PEN100015907, covering the years 2012 to 2015, has been completed. This will be submitted to EHP as part of Arrow's response to a request for information notice from EHP regarding this EA amendment application.

3.2 Schedule B - Water

3.2.1 Condition B10: Watercourses, wetlands and springs

Applicable to:

- *PEN100015907 – B10*

[redacted]

Condition B10 requires that sediment control measures be implemented within watercourse affected by petroleum activities to minimise increases in water turbidity.

No sediment control measures were observed at the Isaac River Crossing #2. It is noted from discussion with the Arrow Site Representative that works have been undertaking in the last 12 months to improve compliance with DEHP's Guideline – Activities in a Watercourse, Lake or Spring associated with mining operations.

It is also noted that the risk of sediment release from these works is low for the majority of the year (due to no water flows), and is only an issue in low flow periods.

It is understood from discussions with the Arrow Site Representative that discussions to determine the appropriate sediment control measures for this environment are ongoing.

It is recommended that appropriate sediment controls be installed prior to the commencement of the wet season and maintained throughout periods of flow within the Isaac River to ensure downstream water quality is protected.

Erosion and sediment control will be managed under TEP MAN16300, which was submitted to the DEHP on 4th January 2013, and approved by EHP on 30th January 2013. This TEP contains a section on Erosion and Sediment Controls and Management, to ensure that all ESC issues are managed in accordance with the MGP EA. The TEP requires Arrow to engage a third party to conduct an assessment to identify ESC issues and develop a priority action list to rectify any identified issues. A works program to address these issues will then be developed. The Isaac River #2 Crossing was identified as a priority issue and will accordingly be part of the works program.

Arrow Health, Safety and Environment (HSE) personnel also participate in risk assessments for works to be carried out in a watercourse. These risk assessments consider erosion and sediment control aspects of proposed works.

To further facilitate compliance with condition B10, Arrow has engaged a consultant to develop an internal guidance document for conducting works in watercourses. This document will incorporate the required outcomes established by EHP guidance document, *Guideline – Activities in a watercourse, lake or spring associated with a resource activity or mining operations.*

In addition, Arrow Energy ran a workshop and provided training materials on erosion and sediment control and conducted field demonstrations to the relevant personnel and contractors. This workshop was utilised to make contractors and personnel on site aware of ESC requirements under the EA, and what actions can be undertaken to minimise the impacts of erosion on site.

3.2.2 Condition B15: Floodplains

Applicable to:

- *PEN100015907 – B15*

s73 [redacted]

Condition B15 requires that petroleum activities do no significantly concentrate, divert or increase the duration of flood flow, or increase the risks associated with flooding.

In order to minimise changes to natural flooding patterns, all petroleum activities must be appropriately assessed and planning (involving flood modelling or equivalent).

Site Representatives indicated that areas of the MGP impacted upon by river or creek flooding are mapped and recorded in their GIS system. However no evidence was provided that showed that the impact of the CSG operations on existing flood patterns had been considered.

It is recommended that the impacts of the CSG operations upon flooding pathways and regimes be considered and formerly assessed in all future planning for petroleum activities.

The majority of the infrastructure for CSG operations is well heads developed in the field. Throughout construction phase, well sites are bunded and ESC measures are installed to ensure that disturbed areas aren't subject to erosion from runoff. At completion of the well site, there is only the well head and some fencing remaining. This infrastructure would have negligible impacts upon flooding patterns or flow of flood waters.

Creek and river crossings are already established within the Lease areas. These crossings are managed to ensure that flows along the rivers are not impeded, and at times of reasonable flow, these crossings are closed to all vehicles.

Infrastructure that could significantly affect flood water flows would include major structures such as dams and compression stations. Arrow employs qualified external engineering consultants to design these types of facilities. The scope of this work includes consideration of applicable regulations to ensure that facilities are compliant with regulatory standards (e.g. Environmental Authority, Water Act, Fisheries Act, etc.). The design scope also includes drainage design, which considers aspects such as surface flow, natural drainage patterns, flood flows, and other related aspects.

3.3 Schedule C - Regulated Dams

3.3.1 Condition C6: Regulated Dams Register

- *PEN100015907 – C6*

s73 [redacted]

Condition C6 requires that the Register is up to date on any given day. Review of the register indicated that a number of details including inspection dates was not up to date at the time of the audit.

The Regulated Dam Register is updated whenever changes are made to the existing dams, or when new dams are constructed. When a new dam is constructed, or if alterations are being made to existing dams, the new data is not included in the Register until all works have been completed.

Arrow acknowledges that the Register, at the time of the Audit, may not have been fully up to date with current information. This has been rectified, and the Regulated Dam Register has been reviewed and updated. This will be maintained on a regular basis in the future.

3.3.2 Condition C19: Mandatory Reporting Level

- *PEN100317009 – C19*

[redacted]

Condition C19 requires the Mandatory Reporting Level be marked on each Regulated Dam. Dams 2, 5, 12 and the Moranbah Camp Sewage Treatment Dam were visited during the site inspections. Not all dams were visited during the audit due to time and site access constraints. MRL signage was observed at Dam 12 but was not evident at Dams 2, 5 and the MCSTD.

All dams have MRL signage and are appropriately signed on the dam wall. Dam 2 is under construction and will be signed once completed. MCSTD has had additional signage installed. A more permanent MRL marking is also being investigated.

3.3.3 Condition C28: Requirements for Existing Dams

- *PEN100015907 –C28*

Condition C28 requires that by 1 October 2010, all existing CSG aggregation dams including Dam 11 must be operated so that during any period of thirty (30) days, the total volume of water leaving the dam other than by evaporation must not be less than 85% of the volume of water that has entered the dam. The Moranbah Gas Project Dam 1 to 11 Operations, Maintenance and Surveillance Plan was reviewed during the audit. No specific reference to this operational requirement was found within the Plan and thus compliance with this condition could not be demonstrated.

Arrow has applied for an amendment to the current EA conditions regarding this condition. This condition is not aligned with the DXP EA, nor does it meet EHP model conditions. The amendment to the current conditions was submitted on 03/07/2012, and is still under negotiation with EHP.

3.4 Schedule D - Land

3.4.1 Condition D26: Chemical and fuel storage

Applicable to:

- *PEN100015907 – D26*

s73 [redacted]

Condition D26 requires that hazardous chemicals corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids be stored in accordance with the relevant Australian Standards.

Whilst onsite it was noted that a number of chemical storage areas are not maintained in accordance with relevant Australian Standards, including areas with no roofing and inadequate bund capacity.

It is understood from discussions with the Arrow Site Representative, that a TEP is currently being prepared in relation to these areas, under continuing liaison with DEHP.

It is recommended that this TEP be finalised and submitted for approval by DEHP as a matter of urgency, with the aim of moving toward compliance with Condition D26 as soon as practicable.

Storage of hazardous chemicals will be addressed under TEP MAN16300, which was submitted to the DEHP on 4th January 2013, and approved on 30th January 2013. Required actions included in this TEP are:

- Commission a qualified consultant and/or contactor to assess existing chemical storage facilities and provide recommendations to meet the relevant MGP EA conditions
- Install and manage temporary bunding on all transient/mobile chemical storage sites
- Develop scope of work and works program/schedule from recommendations as detailed above
- Commence work as per the work program/schedule
- Engage consultant/contractor to design and build upgraded facilities.

Works have commenced to ensure compliance with the TEP, which when completed, will bring Arrow in compliance with the EA.

3.4.2 Condition D27: Chemical and fuel storage

Applicable to:

- *PEN100015907 – D27*

[redacted]

Condition D27 required that any liquids stored onsite that have the potential to cause environmental harm be stored in an appropriate manner.

A Chemical management Procedure has been developed for the Moranbah Gas Project, and was provided during the audit process. Whilst the procedure is fit for purpose, observations made during the site inspection indicate that the procedure does not appear to be implemented in full. For example, whilst onsite it was noted that a number of chemical storage areas had no roofing and inadequate bund capacity.

As stated for Condition 26, it is understood from discussions with the Arrow Site Representative, that a TEP is currently being prepared in relation to these areas, under continuing liaison with DEHP.

It [is]recommended that this TEP be finalised and submitted for approval by DEHP as a matter of urgency with the aim of moving toward compliance with Condition D27 as soon as practicable.

[redacted]

3.4.3 Condition D28: Chemical and fuel storage

Applicable to:

- *PEN100015907 – D28*

[redacted]

s73 73

Condition 28 requires that all containment systems be designed to minimise rainfall collection within the system.

As stated for Conditions D26 and D27, a number of chemical storage areas onsite have no roofing. It is understood from discussions with the Arrow Site Representative, that a TEP is currently being prepared in relation to these areas, under continuing liaison with DEHP.

It recommended that this TEP be finalised and submitted for approval by DEHP as a matter of urgency with the aim of moving toward compliance with Condition D28 as soon as practicable.

Refer to response under Section 3.4.1 above.

3.5 Schedule F - Air (PEN100015907 only)

3.5.1 Condition F1: Air

Applicable to:

- *PEN100015907 – F1*

Condition F1 requires that releases from fuel burning or combustion equipment comply with specified release criteria.

No air quality monitoring is currently being undertaken at the Arrow Compression Plant due to the absence of sampling ports on the compressor stacks.

A TEP has been prepared for the Compression Plant and liaison with DEHP is ongoing. It is understood that the compressor stacks are to be retrofitted to enable monitoring.

It is recommended that the requirements of the TEP be adhered to with the aim of moving toward compliance with Condition F1 as soon as practicable.

Air emissions monitoring of the Moranbah Gas Processing Facility will be addressed under TEP MAN16300, which was submitted to the DEHP on 4th January 2013, and approved on 30th January 2013. Required actions included in the TEP are:

- Commission a consultant to review the current fuel burning or combustion equipment. Consultant is to provide recommendations regarding the feasibility of meeting the requirements of *Schedule F – Air* in the relevant EA. Consultant is to provide options for ongoing management
- Commence negotiations with EHP to agree actions to alter the relevant conditions of the MGP EAs with respect to Schedule F – Air
- Submit an EA Amendment request to EHP
- Following the approval of the EA Amendment requests, prepare a works program and schedule to meet the revised conditions of the MPG EAs
- Commence works program
- Complete works program

Works have commenced to ensure compliance with the TEP, which when completed, will bring Arrow in compliance with the EA.

3.5.2 Condition F4: Air

Applicable to:

- *PEN100015907 – F4*

Condition F4 requires that information within the Register is complete on any given day.

The Register was not up to date at the time of the audit.

It is recommended that the Register be updated and maintained to ensure future compliance with this condition.

Refer to response under Section 3.5.1 regarding condition F1, above.

Arrow will undertake a review of the register when new equipment is brought online that has significant fuel combustion capacity capable of exceeding a threshold of 500 kg of fuel combustion per hour.

3.6 Schedule G - Waste s73

3.6.1 Condition G14: Water Release Reduction Strategy

Applicable to:

- *PEN100015907 – G14*

[redacted]

This condition requires that a Release Reduction Strategy be prepared and implement to minimise release of CSG water to the environment.

Information reviewed during the audit including the Coal Seam Gas Water Management Plan prepared in September 2011 and the 2011 to 2012 Annual Return indicates that a Water Release Reduction Strategy has not been prepared.

A Water Release Reduction Strategy is essential for long term water management at the site and it is recommended that the strategy be prepared as matter of urgency.

The current water management strategy for coal seam gas water does not include the release of water to the environment. Arrow does not plan to release any water to the environment into the future.

To address water storage and reductions in storage on site, Arrow continues to liaise with various commercial entities in and around Moranbah to keep abreast of new developments that may be able to utilise the CSG Water.

Arrow has not made any releases of CSG water to the environment since the 2010/2011 wet season, and does not intend to conduct any releases in the future. Development of a Water Release Reduction Strategy is not considered appropriate given this. As such, Arrow will investigate the possibility of an amendment to the Current EAs in respect to this item.

3.6.2 Condition G15: Water Release Reduction Strategy

Applicable to:

- *PEN100015907 – G15*

[redacted]

Condition G15 requires that a progress report on the Water Release Reduction Strategy by prepared and included in the Annual Return.

The required progress report was not included in the 2011 to 2012 Annual Return.

A Water Release Reduction strategy is essential for long-term water management at the site and it is recommended that the strategy be prepared as a matter of urgency and that all future Annual Returns include the required progress report.

Refer to response under Section 3.6.1, above. Arrow has noted that it will investigate the possibility of an amendment to the Current EAs in respect to the above conditions. As there is no current Water Release Reduction Strategy in place, there is no progress made against this condition.

3.7 Schedule I - Monitoring Programs [redacted]

3.7.1 Condition I18: Air Monitoring

- *PEN100015907 – I18*

[redacted]

Condition I18 requires that monitoring of contaminants released to air be undertaken.

No air quality monitoring is currently being undertaken at the Arrow Compression Plant due to the absence of sampling ports on the compressor stacks.

A TEP has been prepared for the Compression Plant and liaison with DEHP is ongoing. It is understood that the Compressor stacks are to be retrofitted to enable monitoring.

It is recommended that the requirements of the TEP be adhered to with the aim of moving toward compliance with Condition I18 as soon as practicable.

As per Section 3.6.1 above, TEP MAN16300 was approved on 30th January 2013, and outlines a number of activities required to be implemented and completed prior to April 2014 to address emissions monitoring of the compression plant at the Moranbah Gas Processing Facility. These works have already been commenced, and negotiations with EHP regarding EA Amendments will commence shortly, as required by the TEP.

s73 73

3.7.2 Condition I19: Air Monitoring

- *PEN100015907 – I19*

Condition I19 outlines the requirement to prepare an air monitoring program.

As stated for Condition I18, there is currently no air quality monitoring program in place at the Moranbah Gas Project. However, it is understood from discussions with the Arrow Site Representative that air quality monitoring is governed by a TEP.

It is recommended that the conditions of this TEP be adhered to, with the aim of moving toward compliance with Condition I19.

Refer to response under Section 3.7.1 above.

PALM

From: s73 [redacted]
Sent: Thursday, 18 October 2012 9:10 AM
To: PALM
Subject: FW: PL 191, 196 & 115 (PEN100015907) - Annual Return Documentation
Follow Up Flag: Follow up
Flag Status: Red
Attachments: Statement of Non-Compliance (Annual Return Question 10 - Environmental Incident.docx

Dear Sir/Madam

We submitted Annual Return documentation on 5 October for PEN100015907 (PL 191, 196 & 115) that included supporting documentation for reporting period 2011-2012.

Also attached is an additional document that relates to Question 10 for this annual return reporting. Can you please insert this page with the other two documents that relate to that same Question 10. We have now put forward 3 documents that pertain to Question 10.

Any clarification, please contact me.

Regards

[redacted]

[redacted]
Environment Coordinator - Compliance

Arrow Energy Pty Ltd
Level 19, AM-60, 42-60 Albert St, Brisbane QLD 4000
GPO Box 5262, Brisbane QLD 4001, Australia
[redacted]
www.arrowenergy.com.au

From: [redacted]
Sent: Friday, 5 October 2012 2:14 PM
To: 'PALM'
Cc: [redacted]
Subject: PL 191, 196 & 115 (PEN100015907) - Annual Return Documentation

Dear Sir/Madam,

Please find attached the Annual Return for PEN100015907 (PL 191, 196 & 115) and supporting documentation for reporting period 2011-2012. The original documentation will be forwarded by post.

Thank you

[redacted]
Environment Coordinator - Compliance

Arrow Energy Pty Ltd
Level 19, AM-60, 42-60 Albert St, Brisbane QLD 4000
GPO Box 5262, Brisbane QLD 4001, Australia
s73
www.arrowenergy.com.au

RESPONSE REGARDING ANNUAL RETURN QUESTION 10:

10 (a) a statement of whether or not the non-compliance has been previously reported

yes. This non-compliance was reported.

10 (b) a statement describing the non-compliance incident.

One environmental incident occurred during the reporting period of 1 October 2011 – 30 September 2012 that was reported to EHP.

Date: 7 November 2011 – 12:00pm – Hotline record: CR52721
Wastewater treatment system was discharging grey water to the ground.

10(c) a statement describing the environmental impacts resulting from the non-compliance incident

Date: 7 November 2011 – 12:00pm
Wastewater treatment system was discharging grey water to the ground
The approx spill was 25,200 litres.

10(d) a statement describing the actions taken to repair any damage to the environment.

Date: 7 November 2011 – 12:00pm – Wastewater system
The immediate corrective action was to assess the cause of the spill and samples were taken