

IN THE MATTER OF

THE QUEENSLAND FLOODS COMMISSION OF INQUIRY

A COMMISSION OF
INQUIRY UNDER THE COMMISSIONS OF INQUIRY ACT 1950

AND PURSUANT TO

COMMISSIONS OF INQUIRY ORDER (NO. 1) 2011

STATEMENT OF GRAHAM DAVID CORDINGLEY

I, Graham David Cordingley, of [REDACTED] Clayfield, Queensland, do solemnly, sincerely and truly affirm and declare:

1. I am employed by Arrow Energy Pty Ltd (**Arrow Energy**) as acting Environment Manager.
2. I make this statement (**Statement**) in response to the "Requirement to Provide Statement to Commission of Inquiry" from Justice Catherine E Holmes, Commissioner of Inquiry, Queensland Floods Commission of Inquiry (**Commission**) dated 13 September 2011 (**Inquiry Letter**).

Qualifications and Experience

3. I hold a Bachelor of Science (Australian Environmental Studies).
4. A copy of my current curriculum vitae is provided in **Annexure-GDC1**.
5. From December 2010 until present, my substantive role with Arrow Energy has been that of Compliance and Reporting Manager.
6. Since July 2011 I have acted in the role of Environmental Manager at Arrow Energy.
7. At the time of the wet weather events during late 2010 I was working with Lloyd Consulting as a Senior Environmental Scientist and had no involvement with work being undertaken by Arrow Energy at the Moranbah Gas Project (**MGP**).
8. I commenced employment with Arrow Energy on 20 December 2010, subsequent to which I have had ongoing involvement with the 2010/ 2011 flood event (**flood event**) at the MGP as a Compliance and Reporting Manager. The views expressed in this Statement regarding matters

occurring prior to commencement of my employment with Arrow Energy are based on a review of documentation made available to me and which I have identified in the period of time since receiving notice from the Commission.

9. Each matter identified below and shaded in a grey box (**Matter**) correlates with each numbered request in the Inquiry Letter. The information provided subsequent to each of the Matters responds to the proceeding matter.
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<p>Matter 1: A brief description of the main flood-related concerns at the Moranbah Coal Seam Gas project (MGP) (for example – hazardous waste and contaminants at the Project, effect of flood on the downstream environment, discharge requirements).</p>

Safety to Personnel

10. The safety of site personnel was a key consideration during the flood event. On several occasions, for extended periods, field access was restricted due to safety concerns.

Structural Integrity of Coal Seam Water Dams

11. Maintaining the operational integrity of MGP dams was a key consideration during the 2010/2011 flood event.

Discharge of coal seam water to the Isaac River

12. The dam infrastructure on the MGP includes a pipeline from dam 5 to the release point into the Isaac River, as outlined by Condition BA1 of EA PEN100015907 dated 14 September 2010 (found on page 8) and contained at **Annexure GDC-2**. Arrow Energy anticipated the need for additional discharges in the event of a flood event.

Beneficial Use of Coal Seam Water from the MGP

13. Arrow Energy entered into a commercial agreement with Millennium Mine in August 2006 to supply 500 ML/year of coal seam water for the purpose of coal washing. The supply of water to the Millennium Mine ceased when the mine entered into alternative commercial arrangements. This resulted in Arrow Energy being required to retain additional water that would have been

used for coal washings. This impacted on Arrow Energy's ability to accommodate additional water storage arising from the anticipated wet season. This placed increased pressure on the need for water storage and wet weather discharge at the MGP.

Access to Infrastructure

14. -Areas of the MGP tenure area were not accessible for extended periods due to the flood event.

This severely affected the management of water balance between dams in addition to maintaining the operational integrity of the project.

15. Concerns were held relating to delays in scheduled upgrades of water management infrastructure (e.g. new dams) which were intended to increase storage capacity and address increased rain events associated with the wet season.

Matter 2 - An account of the flood preparedness activities undertaken by Arrow Energy in advance of the 2010/2011 wet season at the Project, including whether any particular activities were undertaken as a response to the forecast of an above-average rainfall wet season, or any government communications regarding that forecast.

Upgrade of Water Management Facilities

16. A combination of the following various management strategies were undertaken to manage water levels in Dams in response to excessive rainfall in the lead up to the flood event:

- a. A detailed risk assessment of the dam operations and storage capacities dated 18 November 2010 and identified at **Annexure-GDC3**.
- b. Production was reduced in several stages, details of which are provided in correspondence between Arrow Energy and the Department of Environment and Resource Management (DERM) and located at **Annexure-GDC4**.
- c. Installation of several kilometres of temporary 'lay flat' pipe-work between selected dams to enable 'water balance' activities; and
- d. Acceleration of the construction of additional storage infrastructure (i.e. Dam 11).

17. I have been advised by Arrow Energy representatives that Arrow Energy commenced a program of work to upgrade the water management facilities at the MGP in 2010. This project involved the construction of additional dam storage and a planned reverse osmosis (RO) water treatment plant. The upgrade of these water management facilities was required to ensure adequate capacity during the wet season and also to meet the Qld Government Coal Seam Water Management Policy dated June 2010 and as shown in **Annexure -GDC-5**.

18. Arrow Energy was, and is still, required to verify the water level in each dam prior to 1 November each year to determine whether there is a likelihood of exceeding Designed Storage Allowance (DSA) throughout the wet season.

19. If it is determined that there is potential for the DSA to be exceeded, Arrow Energy is required under the Environmental Authority (EA) to notify DERM and identify contingency plans. DERM was notified on 26 October 2010 that the DSA for Dam 1 would be exceeded. Correspondence from Arrow Energy to DERM advising of this fact is attached at **Annexure GDC-6**. I have been advised by Arrow Energy representatives that at the time of submission of this letter to DERM Arrow Energy envisaged that Dam 11 could be completed by December 2010 in order to alleviate potential storage issues associated with the wet season.

20. Upon Arrow Energy acknowledging delays to the Dam 11 completion date, it was decided that a release to the Isaac was the only means of mitigating the potential overtopping of the dams.

21. I have been advised by Arrow Energy representatives that in the interest of safety Arrow Energy's regarded dam integrity as the highest priority operational issue during the flood event.

22. Ross Stafford and Associates was commissioned to assess all regulated dams at the MGP. Results of this assessment are detailed in a report dated 16 February 2010. Dam 2 was identified in this report as requiring repairs to address structural integrity issues. Following confirmation that the completion of Dam 11 would be delayed and significant rainfall was occurring, Arrow Energy commissioned, URS to specifically evaluate Dam 2's structural integrity. This inspection was undertaken on 22 December 2010, resulting in a report being finalised on 24 December 2010 as

identified in **Annexure GDC-7**. As a result of this inspection, URS recommended lowering of the water level to 4 metres below its DSA.

23. To assist in meeting new EA conditions, namely condition C13 and C14 in EA PEN100015907, Arrow Energy prepared the MGP Water Management Project Execution Plan (Design Plan) dated 16 July 2010 (**Annexure GDC-8**) and in accordance with this plan Arrow Energy was in the process of upgrading infrastructure including Dam 11, a brine storage dam, a RO plant and planning an additional dam for the collection of treated water.

Matter 3 - With respect to the Environmental Authority in force at the Project for the 2010/2011 wet season, an account of:

Any concerns Arrow Energy had arising from the drafting and negotiation of it and consultation between Arrow Energy; and The Department of Environment and Resource Management (DERM);

Any inability on the part of Arrow Energy to comply with its terms; and

Any risks to safety or the environment caused by its terms

24. MGP dams are regulated in accordance with the conditions of the relevant environmental authority. The environmental authority in force at the time of the 2010/ 2011 flood event (EA PEN100015907 dated 10 December 2010) is provided at **Annexure GDC-9**.
25. Infrastructure was designed in accordance with historical EA conditions which incorporated wet weather discharge facilities.
26. During the 2010/ 2011 wet season, the current **EA PEN100015907** did not satisfactorily provide for high flow emergency discharges to the Isaac River.
27. Discharge of coal seam water to a water course requires authorisation under the EA, or in the absence of this, a Transitional Environment Program (TEP). The authorisation of a wet weather conditional discharge to the Isaac River was originally granted under **EA number 170524** granted on 15 November 2004 (**Annexure GDC-10**) with an electrical conductivity (EC) limit of 1500 $\mu\text{S.cm}^{-1}$ measured at the designated downstream location. On 23 January 2006 a revised EA was

imposed (**PEN 170524**) altering discharge conditions and effectively prohibiting discharges to the Isaac River during high flow events.

28. In accordance with Condition C24 of **EA PEN100015907 (Annexure GDC-9)**, in correspondence to DERM dated 26 October 2010 Arrow Energy advised that the DSA for Dam 1 had been exceeded and that production had been curtailed to manage the volume of produced water and Arrow Energy was considering options to regain storage capacity in accordance with the condition C24 of the EA (**Annexure GDC-6**).

Matter 4 - With respect to any transitional environmental program (TEP) or emergency direction (ED) applied for, granted or refused relating to the Project during the period 1 October 2011 to 30 July 2011, an account of:

1. The reason the TEP or ED was required, and his opinion as to whether the TEP or ED was effective in resolving that issue
2. Any concerns arising from the terms of the TEP or ED
3. Any non-compliance with the TEP or ED, and, if so, any actions taken by DERM in response to that non-compliance
4. To the knowledge of Arrow Energy, any adverse effects to drinking water quality, any plant or animal species, any industry or agriculture, the environment or public health that occurred as a result of discharge of water under the TEP or ED

All documents lodged with DERM and all substantive correspondence with DERM, downstream environmental groups or landholders regarding the TEP or ED should be attached to the statement

29. A program notice (**Notice**) was submitted to DERM on 3 December 2010 under Section 333 of the *Environmental Protection Act 1994* (Qld) to control dam water levels at the Project (**Annexure GDC-11**). A copy of the TEP and Decision dated 4 February 2011 to grant approval for draft TEP arising from this Notice is contained at **Annexure GDC-12**.

30. The intention of the TEP was to provide a short term solution for the management of infrastructure integrity through lowering dam levels, by assimilating the former wet weather discharge provisions as per the superseded **EA No 170524** dated 2004 (**Annexure GDC-10**). In my view delays in DERM's issuance of the TEP limited its effectiveness and resulted in unnecessary risk to the structural integrity of water storage infrastructure and potential for over topping of the dams during a period of high flow in the Isaac River. I have been advised that the

opportunity to discharge water to the Isaac River on numerous occasions was lost due to these delays. Discharges during these high flow events would have allowed for additional dilution, which would have reduced potential environmental effects.

31. In general accordance with Draft TEP conditions, an emergency water release to the Isaac River occurred on 14 December 2011, during the TEP application period to address known structural integrity issues with Dam 2 and potential overtopping of this and other dams by infrastructure failure. The discharge was ceased after meeting with DERM later the same day following threatened enforcement action. Notice from DERM regarding this matter is contained in **Annexure GDC-13**.
32. The TEP, granted/approved on 4 February 2011 provided assistance in managing Dam levels for the duration of the limited release events during and following rainfall events, as permitted by the TEP. However, due to the limitations in the TEP and a reduced flow in the Isaac River, a combination of management strategies were undertaken to control the Dam Levels, including limiting production.
33. Concerns arising from the terms of the TEP included the release limits stated in Table 6 of the TEP were unable to be met for all listed parameters. I have been advised by an Arrow Energy representative that DERM were aware that the water quality limits detailed in the TEP would be breached, prior to the issue of the TEP. The results of all sampling and analysis programs were released to DERM as soon as possible following the release of the results from the analysing laboratory. All results were assessed against the release limits and reported to DERM.
34. Reporting timeframes did not allow for delays in transporting sample containers or samples during the flood event, or for circumstances where it was not safe to access sample points.
35. The release limits stated in Table 6 of the TEP were unable to be met for all listed parameters. In particular metal and metalloid concentrations exceeded limitations imposed by the TEP. Analytical results were periodically released to DERM for the duration of the TEP. The complete table of results is identified at **Annexure GDC-14**.

36. I am not aware of any adverse environmental effects resulting from Arrow Energy's releases to the Isaac River under the TEP.
37. Various documents and associated correspondence has been brought to my attention relating to substantive correspondence between Arrow Energy and DERM regarding the above TEP matter. Copies of these documents and associated correspondence are identified at **Annexure GDC-15**.

Matter 5 - A description of any concerns arising from the process of applying for and being granted or refused any TEP or ED, including:

- Arrow Energy's knowledge of the process in advance
- The transparency of the process
- The speed of the process
- The considerations taken into account or not taken into account
- The reasons given for any decision
- Consultation with relevant stakeholders

38. In my view the statutory process associated with the application and issuance of a TEP for water discharges was and remains ambiguous. During the application process, this resulted in time delays in the drafting and finalisation of the TEP detailed above.
39. To the best of my knowledge DERM did not provide Arrow Energy with reasons justifying the issuance of TEP conditions.
40. In my view the overly risk adverse attitude of the DERM towards issuing the TEP did not appropriately reflect the urgency of managing excess water and the safety and environmental risks associated with retaining the water.

Matter 6 - Details of any negotiation of environmental authority conditions or discussions with DERM since flooding experienced in the 2010/2011 wet season to resolve any issues raised above in 3, 4 or 5.

41. I have been advised by Arrow Energy representatives that Arrow Energy met with DERM on the 14 April 2011 to detail its current situation and requirements under the EA PEN100015907 regarding the long term water strategy for the Moranbah Gas Project.

42. I am aware that Arrow Energy representatives met with the Office of the Water Supply Regulator (OWSR) to discuss the permanent discharge of water from the MGP facility in accordance with Schedule B – Water, of EA PEN100015907.

43. I am aware of discussions have been held with OWSR regarding additional approval impositions arising under the *Water Supply (Safety and Reliability) Act 2008*.

44. I am aware of additional discussions between Arrow Energy and OWSR regarding:

- a. extensive sampling requirements that must be conducted post commissioning of water treatment equipment.
- b. The comprehensive nature of the draft analytical suite.
- c. The time consuming nature of approval processes administered by OWSR for any water discharges.
- d. Lack of provisions for emergency water discharges in exceptional circumstances.

Matter 7 - An explanation as to whether the new environmental authority conditions negotiated during 2011, if any, are advantageous or disadvantageous to Arrow Energy in the management of water, contaminants and hazardous waste at the Project, the downstream environment and safety issues.

45. I have been advised by Arrow Energy representatives that no new environmental authority conditions have been negotiated with DERM during 2011 in relation to the management of water, contaminants and hazardous waste associated at the project or the downstream environment and safety issues. An environmental impact assessment must be completed before changes to discharge conditions can be decided. Arrow has commenced this.

Matter 8 - A description of any concerns regarding the potential for pond overtopping at the site between 1 October 2010 and 30 July 2011

46. As previously stated in Items 22, 28, 29, 30, 31.

Matter 9 - An explanation of any current procedures or plans for future procedures by Arrow Energy to manage water at the Project other than by storing it in dams or ponds, including by using desalination plants, purification procedures or any other means.

47. The revised Bowen Basin Coal Seam Water Management Plan (CSWMP) at Annexure GDC-17 provides details regarding current water management processes and planning in progress for future water management processes. I have been advised by Arrow Energy Representatives that

~~the CSWMP is a live document subject to ongoing revision.~~

48. Based on discussions with Arrow Energy representatives, I understand that the current water management process for the MGP involves the following:

- a. CSG water gathering via high density poly ethylene (HDPE) gathering network to aggregation dams; and
- b. Evaporation of CSG water via aggregation dams.

49. I am aware that Arrow Energy is currently installing a water treatment facility as part of a water management program, to facilitate water re-use options.

50. I have been advised by Arrow Energy representatives that the revised water management program will entail the following:

- a. CSG water gathering via HDPE gathering network to aggregation dams (unchanged).
- b. Treatment of all CSG water at a Water Treatment Facility (initially 2ML/d capacity) which employs micro-filtration and reverse osmosis to generate a concentrate water stream and a permeate water stream. This plant will operate at a recovery between 75 – 85% .

51. Based on comments made by Arrow Energy representatives I understand that both permeate and concentrate, will initially be stored in dams in line with EA requirements. Permeate water will undergo ionic amendment to lower the sodium absorption ratio (SAR) to make beneficial use possible. The amendment facility will utilise calcium chloride for SAR adjustment.

52. I am advised that the Water Treatment Facility is currently being constructed and that commissioning of the facility (including associated permeate and concentrate dams) is planned for December 2011.
53. While I understand that treated water will initially be stored in a purpose built Dam, this buffer storage is required to manage demand variations from planned and future water off-takes. I further understand that Arrow Energy is currently actively pursuing beneficial use options for this treated water which are further described in the CSWMP.
54. I have been advised by Arrow Energy representatives of a range of beneficial use options that are currently being actively pursued by Arrow Energy. These options include:
- a. Beneficial use by crop irrigation;
 - b. Beneficial use by surrounding coal industry (e.g. coal washing); and
 - c. Beneficial use by water service providers.
55. I am advised by Arrow Energy Representatives that Arrow Energy's current brine disposal strategy relies on evaporation and concentration in dams until crystallisation technologies have been further progressed and trialled.

Matter 10 - An explanation of that which is involved in managing water at the Project other than by storing it in dams or ponds, including using desalination plants, purification procedures or any other means.

56. There are currently no CSG water treatment facilities in operation at the MGP; however a reverse osmosis plant is currently being constructed to treat water for re-use/discharge. It is anticipated that this plant will be commissioned in December 2011.
57. Based on information provided by Arrow Energy representatives, I understand that Arrow Energy currently possesses a water supply licence (under renewal) for the use of untreated water for industrial beneficial use at Millenium Mine. The water is planned for use in coal washing activities in the approved quantity of 500 ML/yr. I understand that due to impacts arising from the 2010/ 2011 wet season, this agreement has not been utilised. I further

understand based on discussions with Arrow Energy officers that it is unlikely that the Millenium Mine will require beneficial use water in the near future.

58. The CSWMP (**Plan**) has been developed to be utilised in conjunction with Arrow Energy's CSG Water Management Strategy; and implemented to define and communicate Arrow Energy's strategy for the current and future management of CSG water in the Bowen Basin. Activities addressed by this plan include:

- a. Gas exploration;
- b. Appraisal; and
- c. Production interests for the domestic market.

59. In addition to fulfilling relevant legislative and policy requirements, the objectives of this Plan are to define the hierarchy of options for the disposal of CSG water from appraisal and production activities, by:

- a. Establishing a management framework for each CSG water disposal option;
- b. Identifying the environmental values potentially affected by activities addressed by the Planning as well as mechanisms for protection (e.g. established procedures);
- c. Ensuring action is taken, if any of the measurement criteria are not satisfied.

Signed and solemnly, sincerely and truly affirmed and declared by Graham David Cordingley, of [REDACTED] Clayfield, Queensland at Brisbane, Queensland, this 26th day of September, 2011, before me.

Witness Signature

SUSAN MOULE

Print Name

Justice of the Peace (Qualified).

