

## QMDC's submission on the Draft Bore Assessment Guideline 2012

### Submission To:

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These comments are presented by the Chief Executive Officer, Geoff Penton, on behalf of the Queensland Murray-Darling Committee Inc. (QMDC). QMDC is a regional natural resource management (NRM) group that supports communities in the Queensland Murray-Darling Basin (QMDB) to sustainably manage their natural resources.

### 1.0 Specific comments

#### 1.1 Executive summary

The Water Act sets out a range of circumstances when a bore assessment must be undertaken, which include:

- an underground water impact report (UWIR) or an amendment of a report which has water bores located in an 'immediately affected area'
- a final report (when the tenure is about to cease) or an amendment of a report takes effect, for any water bores in a 'long term affected area'

QMDC acknowledges the set of circumstances described by the Water Act for when a bore assessment must be undertaken. QMDC also believes the Guideline needs to describe and define when off-site impacts and areas that may be impacted short term trigger the need for a bore assessment.

The outcome of a bore assessment requires that petroleum tenure holder enter into a 'make good agreement' with the bore owner. If it is determined through the bore assessment that a bore has, or is likely to have, an 'impaired capacity' the make good agreement must provide details on the make good measures to be undertaken. This ensures that bore owners are able to maintain access to a reasonable supply of water for the bore's authorised purpose.

QMDC asserts another step in the process needs to be articulated. Before water extraction is permitted to continue the need for an agreement that *make good measures* can actually 'make good'. What if the 'impaired capacity' is too great and there is no 'make good' option practically available.





QMDC, therefore, believes the development of the “make good” threshold approach informed by a wide range of data and research would provide greater clarity and certainty for the limits that must be placed on unacceptable underground water impacts.

The Healthy Water Management Planning (HWMP) process, for example, should result in water quality thresholds for surface water and groundwater zones. QMDC recommends that the QWC ensures the threshold approach transposes across to water quality with particular reference to evolving HWMP. The water quality link is particularly important in the consideration of risk of inter aquifer connectivity associated with CSG mining.

QMDC urges EHP to facilitate a policy debate as part of the Guideline recommendations considering the notion of establishing a threshold limit beyond which “make good” is not an acceptable management option.

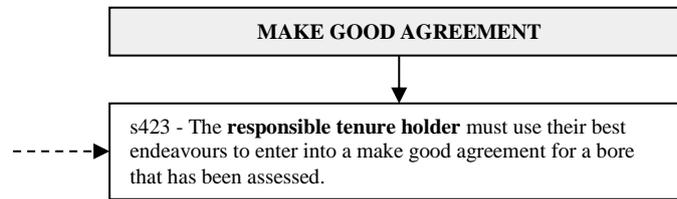
Threshold limits would help to define those natural water resource assets identified as being nationally and regionally at risk to the impacts caused by activities and infrastructure associated with all industry, commercial business and domestic water resource use on the GAB, the Surat and Bowen Basins, and the associated alluvial systems, and aquifers.

QMDC recognises that QWC has advanced the use of modelling and monitoring data across tenures to come up with the best available estimate of impacts of CSG related water extractions on water levels or pressure heads for existing bores and aquifers.

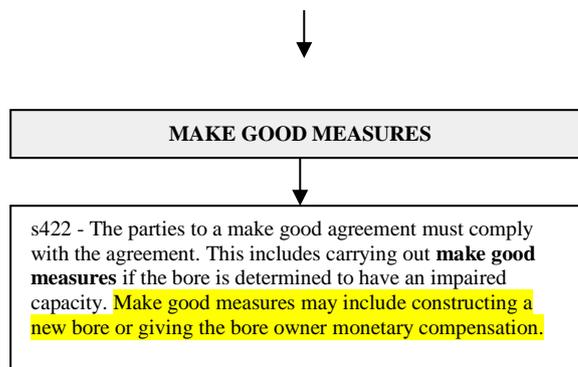
QMDC is concerned that QWC’s Water Monitoring Strategy only addresses “basic water quality” (See UWIR pp. xv). Including more extensive monitoring of water quality within the scope of the UWIR will enhance regional capacity to identify areas of concern for water quality based on impacts of extraction on volumes in production aquifers. A threshold limit approach would allow the Guideline to also consider set pollutant concentrations and discharge volumes so that unacceptable pollutant load risks would not be permitted for both individual site and cumulative impacts on aquifers.



## 1.2 Figure 1 – Requirements for a bore assessment and make good agreements



QMDC asserts another box is required here to recognise that if 'impairment' is too severe then no make good agreement can be made because a make good measure is not practically available



QMDC does not see the point of prescribing some *make good measures* and not others in figure 1.

## 1.3 When a bore assessment needs to be completed

The Water Act sets out a range of circumstances when a bore assessment must be undertaken, including:

- if an underground water impact report (UWIR) or an amendment of a report takes effect, for water bores located in an 'immediately affected area'. An "immediately affected area" means an area that will have an impaired capacity within the next three years. A UWIR must be completed every three years.

QMDC believes that a 3 year time period is not a safe time duration to measure extraction on the grounds that the UWIR has shown that there are significant time lags for impacts, longer than those presented in model outputs – ie decades to centuries rather than the years to decades described in economic, production and impact assessments presented in public forums. Even if impacts are likely to be over extended periods, the public deserves to know what the likely impacts are so they can assess the merits of ongoing development. QMDC believes that the UWIR needs to be revised yearly in line with QWC's annual reporting in order to ensure potential impacts can be avoided at the earliest opportunity. Additionally a 3 monthly reporting timeframe for CSG companies is deemed more reasonable to inform any revised changes.

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- if a final report (when the tenure is about to cease) or an amendment of a report takes effect, for any water bores in a 'long term affected area'

QMDC is not sure how the Guideline will address the need for a bore assessment with regards to:

- UWIR predictions e.g. where there will only be 50% recovery for the Walloon Coal Measures, Springbok Sandstone and the Condamine Alluvium, 30 to 50 years after impact (See UWIR p.xv *Timing of Impacts* & p.56); and
- the timing of impacts.

QMDC would like to see more guidelines around recovery rates, maximum impacts and cumulative impact scenarios related to the ending of a tenure. QMDC would also like to see some discussion around issues and impacts that may evolve should a new industry come on board or a project be expanded and what affect this may have on UWIR predictions and the need for bore assessments.

What are the "make good" options between the end of the tenure and the predicted recharge life?

- if the chief executive of the Department of Environment and Heritage Protection (EHP) believes that a water bore can no longer supply a reasonable quantity or quality of water for its authorised use.

QMDC suggests the Guideline articulates clearly what information the chief executive's belief needs to be based on.

A bore assessment is undertaken by the petroleum tenure holder.

QMDC argues that a bore assessment should be paid by the petroleum tenure holder and undertaken by a suitably qualified person that is either chosen by the bore owner or petroleum tenure holder (if the bore owner agrees).

The Guideline must also articulate that the assessor and quality of the assessment data must be guaranteed and independent from the petroleum tenure holder's company.

## 1.4 Bore assessments and make good agreements

A make good agreement for a water bore is an agreement between the bore owner and the tenure holder responsible for the bore's make good obligations.

The purpose of a make good agreement is to ensure that water bore owners impacted by the exercise of petroleum tenure holder underground water rights are able to maintain access to the necessary supply of water for the authorised use and purpose of their bore. The agreement is required for water bores that are predicted to experience a decline in water quantity, or decline in quality resulting from a water level decline.

QMDC believes the Guideline must define the duration of time that bore owners should be enabled to maintain access to the necessary supply of water.

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A make good agreement is required for all bore assessments and must be made within 40 business days after the bore assessment is undertaken or a later day agreed to by the chief executive. A make good agreement includes the following information:

- the outcome of the bore assessment for the bore, including whether the bore has or is likely to have an impaired capacity; and
- the make good measures to be undertaken by the **tenure holder**.

Make good measures are only required if a bore has an impaired capacity or is likely to start having an impaired capacity.

QMDC would like it stated in the Guideline that a make good agreement may include an agreement that make good measures and not practically available and therefore extraction is not permitted. It also needs to be stated how long a tenure holder is obligated to undertake make good measures.

## 1.5 Make good measures and impaired capacity

The term impaired capacity prescribes the circumstances when the exercise of the petroleum tenure holder's water rights prevents the bore from being able to supply a reasonable quantity and quality of water for the bore's authorised purpose or use. Under Section 412 of the Water Act, an existing water bore<sup>1</sup> has an impaired capacity if:

- there is a decline in the water level<sup>2</sup> of the aquifer at the location of the bore because of the exercise of underground water rights; and
- because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its authorised use or purpose.

Under section 412 of the Water a new water bore has an impaired capacity if:

- there is a decline in the water level of the aquifer at the location of the bore because of the exercise of underground water rights; and
- the decline is more than the decline predicted at the location of the bore in the underground water impact report; and
- because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its authorised use or purpose.

Impaired capacity for the purposes of Chapter 3 of the Water Act does not include any impairment of a water bore caused by factors other than a petroleum tenure holder's extraction of underground water. For example, a bore that cannot supply a reasonable quantity and quality of water because of natural environmental factors, such as drought, does not have an impaired capacity.

<sup>1</sup> An existing water bore is any water bore in existence before the first underground water impact report that relates to the area in which the bore is situated takes effect.

<sup>2</sup> Water level is defined as follows:

- (a) for artesian water—the level to which the water would, if it were tapped by a water bore and the water were contained vertically above the surface of the land, rise naturally above the surface of the land; or
- (b) for subartesian water—if the aquifer were tapped by a water bore, the level of water in the water bore tapping the aquifer.



If it is determined through the bore assessment that a bore has, or is likely to have, an 'impaired capacity' the make good agreement must provide details on the make good measures to be undertaken. This ensures that the bore owner is able to maintain access to a reasonable supply of water for the bore's authorised purpose.

QMDC asserts baseline data needs to clearly determine the cause of impairment. QMDC is concerned that in drought conditions, for example, impairment may be exasperated. The inherent right to extract water under the *P&G Act* should therefore be curtailed so impairment to bore owner is not unduly suffered due to a legal prejudice towards CSG companies' legislative right to water.

QMDC recommends that the threshold limit approach as described earlier should be adopted to inform section 412.

QMDC believes that baseline assessments when establishing details about water bores for "make good arrangements" are not best carried out close to the time when impairment is expected to begin occurring. Accepting impairment is inevitable undermines QMDC's suggested threshold limit approach to defining unacceptable levels of groundwater impacts. Historical records may aid future UWIR analyses and bore assessments by taking into consideration a range of wider factors such as climate change, operations, improvement to technology etc.

On a more technical level, QMDC is concerned that the baseline assessment programs of CSG companies assume that there is a zero or unlikely risk of inter aquifer connectivity associated with bore construction, maintenance and rehabilitation.

QMDC staff have discussed this issue both formally and informally with mining and environmental advocates and have had no assurances from a single CSG company representative that the risk of inter aquifer connectivity associated with bore construction, maintenance and rehabilitation is zero. Although much is being done to minimise the risks associated with bore construction this improvement in practice does not totally remove the risks. QMDC would argue that in reality it is likely that approximately 10% of bores may have problems at some time (an opinion based on conversations QMDC's staff have had with drillers and hydrologists).

In QMDC's opinion a risk assessment should therefore be undertaken as part of the baseline assessment program to quantify possible impacts on water levels and water quality due to inter aquifer connectivity at bores. Such a risk assessment should consider:

- Existing problems with CSG and other bores
- Ongoing risks during:
  - Exploration
  - Production
  - Rehabilitation
  - Post rehabilitation
- Risks may include:
  - Faulty bore construction
  - Poor bore maintenance

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- Poor bore rehabilitation
- Tectonic movement or other natural or unnatural phenomena that may compromise geological integrity in the vicinity of bores

The risk assessment should also identify mechanisms to minimise risks to water levels and water quality possibly including:

- Continuous improvement in methods and compliance associated with bore construction
- Continuous improvement in methods and compliance associated with bore maintenance
- Continuous improvement in methods and compliance associated with bore rehabilitation
- Water quality characterisation and checks associated with monitoring to ensure early detection of changes in aquifer waters that may indicate impacts from adjacent aquifers
- (“Emergency”) response plans to document how breaches in aquifer integrity should be handled including recommendations to ensure regulatory, technical and financial capacity remain in the region to deal with any breaches even beyond the life of CSG production enterprises.

There is therefore a real need to quantify:

- the (range of ) likelihood of interaquifer transfer due to poor bore integrity (construction, operation and post rehab stages);
- likely (range of ) average and cumulative volume of transfer between aquifers; and
- risk assessment of likelihood/significance for range of likely transfer for expected levels of development.

## 1.6 Giving notice to the Queensland Water Commission and bore owner

The new Queensland Government has made a range of commitments in the management of petroleum activities on groundwater. As a result, the powers and functions of the QWC may change in the future.

This sentence does not provide communities the confidence they seek in a document like the Guideline or associated decision making and assessment processes. Communities, landholders, bore owners who are already feeling the impacts of the CSG industry need to have faith that improved regulation of the industry must retain bodies that have the power and functions to do the job well-resourced and with integrity. The powers and functions of QWC should be written in a manner that incorporates increased knowledge and allows the QWC to address future challenges and issues.

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## 1.7 Section 2.0 Collection of data and qualifications

### Minimum qualifications for persons conducting bore assessments

The minimum requirements for persons conducting the field measurements required for a bore assessment are:

- a minimum of two years prior experience in the following fields:
  - underground water level monitoring programs, including monitoring of water level in bores equipped with pumping infrastructure
  - the conduct of underground water quality sampling programs
  - underground water hydrology and/or engineering
- a practical knowledge of water bore construction and infrastructure.

QMDC would like to know who will assess these fields and recommends that the experience required must be to a level recognised within certain environmental management and industrial standards (national and international), not just a company's standard.

QMDC also recommends the inclusion of another minimum requirement

- the completion of recognised training through either 'in house' expertise or specialist companies

When allocating personnel to conduct a bore assessment, the petroleum tenure holder should be mindful that they must be able to demonstrate that these persons satisfy the minimum qualification requirements. Failure to use appropriate field data collection personnel may impact the petroleum tenure holder's rights in any future bore assessment process.

Should the bore owner be concerned that the person(s) conducting the bore assessment do not have the appropriate skills and experience, the bore owner may request the tenure holder to provide evidence of the person(s) skills and expertise.

## 1.8 Minimum requirements for quality assurance and quality control

A formal quality assurance program must be developed by the tenure holder which is consistent with the principles of AS/NZ9000 and QA/QC requirements of AS5667 and the DERM Monitoring and Sampling Manual. The primary purpose of this program is to document the procedures and protocols for all aspects of the bore assessment and must include quality control procedures.

Quality control procedures may include requirements such as performance of work by two personnel, thus enabling field checks, and analysis of duplicate water quality samples. It is the responsibility of the petroleum tenure holder to develop relevant best practice quality control procedures.

QMDC asserts government has a role to play as well informed by planning tools such as Regional NRM plans and strategies, Regional Water Quality guidelines, CSG policies, bioregional assessments, environmental accounts, regional statutory plans etc.

QMDC would like to know who will assess these best practice quality control procedures.



## 1.9 3.0 Essential elements of a bore assessment

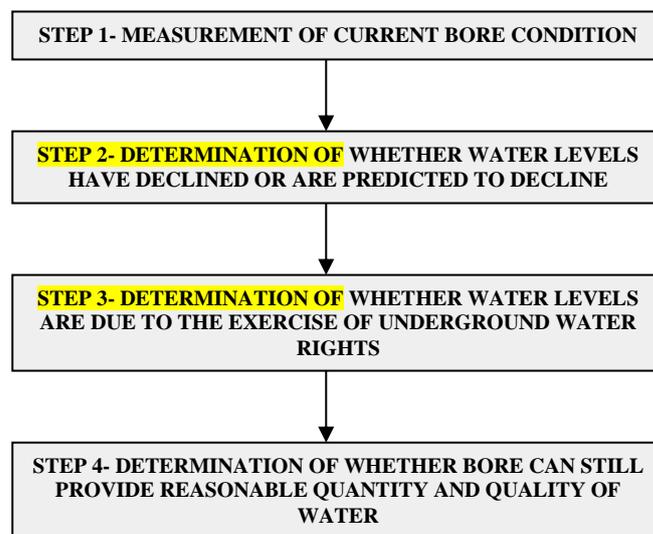
The carrying out of a bore assessment must involve the following four steps:

**Step 1** - Measurement of the current bore condition

**Step 2** - Determination of whether water levels have declined or are predicted to decline

**Step 3** - Determination of whether declining water levels are due to the exercise of underground water rights by a petroleum tenure holder

**Step 4** Determination of whether the bore can or will continue to provide a reasonable quantity and quality of water for its authorised use or purpose.



QMDC recommends including determinations of water quality for steps 2 and 3 as well as water levels.

QMDC asserts that legislative change is urgently needed to ensure make good arrangements triggered for water quality must not only be for when the impairment of water quality is triggered by a decline in water level. Make good agreements and measures are required for CSG activities that cause a change in water quality that has not occurred with a corresponding impact on water quantity.

Not captured under the current guideline framework is bore failure as a result of gas migration. Given that the productive area of the Walloons are in the bottom layers, but there are reasonable quantities of gas on the upper Walloons, there exists the potential for these upper gases to migrate up the outer sleeves of the bore and into shallower aquifers. As the shallow aquifers are generally used for drinking water/ potable supplies, there is a risk here that is not sufficiently covered by the Guideline.

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## 1.10 Step 1- Measurement of the current bore condition

### Minimum requirements

- 1 When measuring the current bore condition, the bore assessment must be carried out in accordance with the requirements as outlined in the [department's Baseline Assessment Guideline](#).
- 2 The bore assessment must verify where bore details remain unchanged from the baseline assessment
- 3 The bore assessment must state any variation to the current bore condition from the baseline assessment.
- 4 If a baseline assessment has been carried out previously, and the method for carrying out the bore assessment is different, the variation must be fully explained.

QMDC has not had the time to technically assess these guidelines in light of the comments made on the Guideline and believe having enough time to do so would have provided an opportunity to make more informed comments on the process of measuring bore condition.

## 1.11 Step 2- Determining water level decline

### How to determine if a water level in a bore has declined?

If a baseline assessment has been previously carried out, comparisons must be made between the bore assessment data collected and the baseline assessment data collected from the water bore.

As outlined in the baseline assessment guideline, a datum point must be established on the water bore to ensure that any future measurements taken in the water bore will be referenced back to same point. Therefore, to determine if a bore has declined, comparisons of [water level measurements](#) must be based on the same reference point as identified during the baseline assessment of the water bore.

QMDC recommends that comparisons need to include water quality measurements as well as water levels.

Further to this recommendation QMDC believes discussion is required to address the following issues:

- legacy pathways on old plugged and abandoned wells- assessment of risk
- problems with "estimating" water level (who estimates/conflict of interest) if water level could not be achieved
- standing water level going unverified in company boreline assessments where company cannot access casing (e.g. some windmill equipped bores)

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The Guideline does not allow for a potentially large number of bores in the QMDB landscape that are either plugged (some incorrectly) or abandoned. What is the impact of the risks these pose to both current and future impairment of operational or new bores? Are CGS companies taking into account these types of bores and the impact they may have, for example, through gas migration and impact on water quality? Who is responsible to fix these? Should there be a requirement to include these types of bores in the make good agreement?

Where baseline assessment data is not available or a baseline assessment has not been carried out, all available water level data should be used to estimate historic water levels. All available water level data may include but is not limited to the following:

- water levels recorded at the time of drilling;
- water level data from nearby bores (including department bores and bores selected for the the UWIR water monitoring strategy);

QMDC has been informed by some landholders that some of the assessors used by the CSG companies are not prepared to risk putting their sensors down windmill equipped bores for fear of it jamming. Landholders are being advised that if they have to pull the bore up at any time to telephone the assessor and the assessor would return to the site. The bore owners therefore only have old records to base water levels on. Landholders are alarmed by the lack of capacity of assessors because no data is being collected leaving landholders with records that are very out of date.

Additionally some assessors are providing reports that consist of a very detailed chemical analysis of the water, but no indicators as to whether there is anything abnormal, so basically no comments are given on the overall water quality in the report they produce. This is urging some bore owners to seek an independent review of the report in order to gain a second and more informed opinion.

QMDC recommends that the word 'nearby' needs defining.

- groundwater contours;
- other data collected by private bore owners but certified by an independent third party.

The sources of information used to determine the historical water level must be clearly noted. When comparing the current water level data and historic water level data, the magnitude and time period of the water level decline must be clearly noted.

**How to determine if the water level decline in a new bore is greater than predicted?**

QMDC recommends the need to include water quality measurements as well as water level decline. See 2. below also.

For new bores, to determine if the decline is greater than predicted, two data sources need to be compared:

1. Any declines in water levels that have occurred for the bore; and
2. Declines in water levels that were predicted in the relevant approved UWIR

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QMDC believes a third data source needs to be added, requiring the word 'two' to change to 'these'.

3. Any decline in water quality that has occurred as assessed through monitoring

It is likely these **two** data sources will be different as the actual decline is likely to have been measured over a different period of time than the UWIR prediction period which is **commonly three years**.

To enable comparisons to be made between water level declines for overlapping but non-identical time periods, **assumptions may need to be made** about the rate of decline in both cases. The petroleum tenure holder should determine whether it is appropriate to assume a constant decline in either or both cases. Any assumption must be clearly stated to support the water level comparison.

QMDC believes three years is too long an interval as per above comments at **1.3**.

QMDC asserts that the Guideline must provide safeguards with regards to the assumptions that can be made. QMDC suggests the following areas, for example, are still fraught with uncertainty:

- Recharge rates/life
- Erosion of aquitards
- Groundwater responses to reinjection of CSG water into underground aquifers
- Impacts on water levels and water quality due to inter aquifer connectivity at bores

## Minimum requirements

1. If a baseline assessment has been previously carried out, comparisons of **water levels** must be:
  - a) made between the bore assessment data collected and the baseline assessment data collected for the water bore and
  - b) based on the same reference point as identified during the baseline assessment of the water bore.
2. The sources of information used to determine the historical **water level** must be clearly noted.
3. When comparing the current water level data and historic **water level data**, the magnitude and time period of the **water level decline** must be clearly noted.
4. For new bores, comparisons must be made between any declines in water levels that have occurred for the bore and declines in water levels that were predicted in the relevant approved UWIR.
5. For comparisons between **water level** declines for overlapping but non-identical time periods, assumptions about the rate of decline in both cases must be stated

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6. For assessing whether the bore is likely to start having an impaired capacity, the assessment must refer to the drawdown predictions contained in the most recent approved UWIR.

7. Where an UWIR has not yet been approved for the area where the bore is located, the methods proposed in the UWIR guideline for predicting drawdown must be applied to predict **water level declines**.

QMDC recommends the need to include water quality measurements as well as water level decline

## 1.12 Step 3 - Determining if water levels declines result from petroleum activities

### Purpose

The purpose of step 3 is to determine whether water level declines are due to petroleum tenure holders exercising their underground water rights.

There are a number of factors that affect ground water levels. A bore may not be able to supply a reasonable quantity of water because of **natural environmental factors such as drought**. If this is the case, petroleum tenure holders don't have a responsibility to make good where it is determined water level declines are not due to the exercise of underground water rights.

QMDC believes more serious consideration needs to be given to the cumulative impact of natural environmental factors and petroleum activities on bores.

### How to determine if water level declines are due to the exercise of underground water rights?

When assessing whether the declines in groundwater level have occurred because of the exercise of underground water rights, the following information must be referred to in making this assessment:

- whether declines were predicted to occur in the area in the relevant UWIR/s<sup>3</sup>;
- the proximity of the bore to the extraction well(s);
- **assessments of the connectivity between aquifers supporting the water bore and the gas well<sup>4</sup>;**
- any available data on groundwater level trends in bores in the vicinity of the water bore that tap the same aquifer to determine if declines are localised or regional. This could include government monitoring bores and bores selected for the relevant UWIR water monitoring strategy; and

<sup>3</sup> Relevant UWIRs may include the Surat CMA UWIR developed by the QWC and/or the UWIR developed by the Petroleum Tenure Holder (PTH) for the tenure where the bore is located. Relevant UWIRs also refers to UWIRs developed by the PTH for tenures adjacent to the tenure where the bore in question is located. Therefore, PTHs must liaise with other PTHs to ensure water level declines are not due to exercise of underground water rights.

<sup>4</sup> For guidance on how to assess the connectivity between aquifers supporting the water bores and gas well, refer to section 3.1.1.2 of the former DERM's Underground Water Impact Reports and Final Reports guideline.



- assessments of regional groundwater elevation contours to determine if there is any evidence of cones of depression expanding outwards from developed areas.

If a draw down results a three year timeframe to measure and assess impairment may well be too late to make good any impairment due to interconnectivity.

### Information suggests that declines are not due to exercise of underground water rights

If there is no evidence that declining water levels are due to the exercise of the petroleum tenure holder's underground water rights, the petroleum tenure holder should investigate other possible causes for the declining water levels and make a note of this circumstance. The purpose of further investigation is to support the claim that declining water levels were not due to the exercise of the petroleum tenure holder's underground water rights.

What should this investigation entail, where should the notes be recorded, will the public have access to these notes and investigation results?

### 1.13 Step 4- Assessing bore capacity

The following must also be referred to where possible when determining if the bore can still provide a reasonable quantity of water for its authorised use or purpose:

#### 1. Information of the water licence and metered use

If information about the water licence and metered use is not available, water requirements should be estimated. To estimate the water requirements, the Baseline Assessment Guideline may be referred to. Information on estimating water quantity requirements for livestock and domestic use can be found in Appendix 1 of the Baseline Assessment Guideline

#### 2. Existing plans for any allocated water entitlement

Who is permitted to make these estimations?

#### *How to determine whether the water quality has been or has the potential to be negatively impacted*

To determine whether the water quality has been negatively impacted as a result of water level declines, available historical water quality data (e.g baseline assessment data), should be compared with the data collected for the bore assessment. In order to make justifiable comparisons between the two sets of water quality data, the detection limits and analytical methods used for water quality analyses must be equivalent.

Negative impacts on water quality that may be associated with water level declines due to the exercise of underground water rights include:

1. increases in salinity and/or changes in major ion composition due to induced flow of water from underlying or overlying formations; and/or
2. increases in the concentrations of dissolved gas associated with the depressurisation of coal seams

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To confirm whether a bore can still provide a reasonable quality of water for its authorised use or purpose, the following guidelines should be referred to:

- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000);
- The EHP Environmental Protection (Waste Management) Regulation 2000 Guideline for the Approval of Coal Seam Gas Water for Beneficial Use; and
- The Australian Drinking Water Guidelines 2006.

In the case where a bore assessment indicates that the water quality has not yet been negatively impacted but may be negatively impacted in the future due to a decline in water level, the assessment must estimate the extent of impact and evaluate the likelihood of these negative impacts occurring. **This can be achieved by evaluating the following contributing factors:**

- Magnitude of the water level decline;
- The connectivity between the target aquifer and the aquifer where the landholder's bore is screened;
- Differences in water quality between the aquifer where the landholder's bore is screened;
- The water quality in aquifers overlying or underlying this aquifer.

QMDC does not believe all the negative impacts may be captured in this section and therefore recommends Regional Water Quality Guidelines, Regional NRM Plans, environmental accounts, bioregional assessment reports and other relevant reports and planning documents be listed as key points of reference for assessing water quality. QMDC also suggests this section of the Guideline needs to be reviewed by the federal Independent Scientific Committee, Wentworth Group of Concerned Scientists and other key regional science bodies and water quality technicians.

If water quality is impaired what are the make good measures that are practically available?