



Queensland Murray-Darling Committee Submission on Australia Pacific LNG Project's Application to amend Environmental Authority (PEN 100070307)

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1.0 Background

The Queensland Murray-Darling Committee Inc.'s (QMDC) submission is informed by the Regional Natural Resource Management (NRM) Plan and QMDC's policy entitled *The potential impact of the mining and energy industry on natural resource management* Revised Draft 2011. This policy was based on significant consultation with a wide range of organisations in the Queensland Murray-Darling Basin (QMDB). Together with the Regional NRM Plan it recognizes the need to prevent adverse impacts to the extent, value and function of the region's natural assets.

It is paramount to the region's environmental, social, cultural and economic well-being that DERM considers both the cumulative impact of the mining and energy industry as a whole alongside the impact of individual site activities.

QMDC seeks a decision by DERM that demonstrates adequate protection for the natural resource assets of the QMDB. QMDC asserts "adequate protection" of the region's natural resource assets must be within determined threshold limits for those assets, and which also defines the point at which impacts on those assets are no longer acceptable. The prevention, management or mitigation of impacts, whether direct, indirect or offsite must safeguard the region's finite resources such as water, soil, air, nutrients and associated ecosystems and their biodiversity.

QMDC's submission has been limited by the unrealistic timeframes to respond and consult independent scientific and technical expertise to examine Australia Pacific LNG Pty Limited's application for an amendment to an existing environmental authority, **PEN100070307** under section 310S of the *Environmental Protection Act 1994* in relation to **petroleum leases 195, 200, 203, 204 and 268** for the purpose of: trials of gas re-injection; trials of land spraying of drilling muds; the construction of a regulated dam with a total storage less than 5 ML within the buffer of environmentally sensitive areas (the Application).

PEN100070307 Amendment

Submission



Funded by:





However QMDC assessment of this proposal is that it is quite unacceptable and clearly a step backwards in the adaptive management approach that DERM has been taking in industry practice improvements. QMDC asserts **section 310V** of the *Environmental Protection Act 1994* is triggered by the Application owing to the lack of time allowed, the significant departure from the original EIS and current EA and the nature of the new types of CSG activities proposed by the Application.

310V EIS may be required

- (1) The administering authority may, within the later of the following periods to end, decide whether an EIS is required for an amendment application—
 - (a) 10 business days after it receives the application;
 - (b) if the administering authority, within the 10 business days, gives the applicant written notice that it has fixed a longer period—the longer period.
- (2) However, despite any decision by the administering authority, the Minister may, at any time before the application is decided, decide—
 - (a) whether there is to be an EIS requirement for the application; and
 - (b) at what stage, or step within a stage, under this part the processing of the application must start or resume.
- (3) The administering authority and the Minister must, in making a decision under this section, consider the standard criteria.
- (4) The administering authority must, within 10 business days after a decision is made under this section, give the applicant written notice of the decision.
- (5) Despite subsections (1) and (2), an EIS must not be required for the application if a relevant resource authority for the application is, or is included in, a significant project.
- (6) Also, a decision under subsection (1) or (2) ceases to have effect if a relevant resource authority for the application is, or is included in, a significant project.

2.0 Key Issues

QMDC identifies the following as key issues associated with the Application:

- Lack of project planning & alignment to the Regional NRM Plan
- No guarantee that financial assurance will cover potential damage
- Climate change not adequately addressed
- Land management not best practice & lacks scientific proof
- Regional ecosystems not protected
- CSG water management not a long term solution
- Detention pond- siting within buffer zone & no confidence in design
- Gas reinjection trial does not reflect sustainable production practices
- Landspraying drilling fluids lacks scientific research on bioaccumulation impacts on humans, stock and environment
- Technical maps lack sufficient detail and science
- Independent peer review of scientific reports not conducted
- Cumulative impacts not calculated
- Public notification & consultation & the use of trigger maps needed to improve community engagement

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- Key stakeholder meetings needed to encourage best practices in QMDB

3.0 Project and Field Planning

3.1 Alignment of the proposed projects, and trials to the Regional NRM Plan

QMDC submits that the Application does not demonstrate a comprehensive understanding of the projected impacts of the trials and the siting of the detention pond in relation to the impact on the region's natural resources and other assets as identified in the Regional NRM Plan and the regional communities' aspirations for these assets.

The Regional NRM Plan is a framework that is available to the proponent to improve the management and condition of the natural resources in the Spring Gully development area. The Regional NRM Plan is integral to Origin's environmental responsiveness will help to align the associated *Environmental Management Plan* (EMP) to regional resource conditions and aspirational targets and support the actions of the regional communities' to reach those targets.

The Regional NRM Plan because it integrates with other regional planning activities such as the draft Regional Vegetation Management Plans (RVMP), Water Resource Plans and other proposed regional planning instruments exists to enable Origin to invest in natural resource planning processes enabling more comprehensive NRM outcomes.

Additionally QMDC and other NRM organizations are key regional stakeholders and if involved and considered by Origin's project, field and environmental planners will provide Origin the opportunity to adopt best practices based on invaluable landholder and NRM experience and technical expertise.

QMDC submits that the Application neglects to fully consider and take into account the strategic direction the Regional NRM Plan offers the CSG industry in their project and field planning. Due consideration would have provided Origin with the opportunity to consider its Application in a manner that supports the coordinated delivery of natural resource management in the QMDB.

3.2 Recommendations

3.2.1 That the Application be rejected because it failed to align its environmental management goals to the Regional NRM Plan and other associated regional plans.

3.3.2 That should the Application not be rejected outright then DERM's decision manages changes in land use and environmental management planning and practices, by requiring stringent conditions for Origin to:

- **protect and conserve regional and catchment environmental values;**
- **undertake activities to arrest degradation and rehabilitate degraded areas. (This needs to include rehabilitation of soils, protection of aquifers and groundwater resources, restoration of aquatic and**



terrestrial ecosystem connectivity fragmented by mining and associated infrastructure);

- adopt climate change adaptation strategies; and
- adopt sustainable gas production practices.

4.0 Financial assurance

4.1 QMDC submits that regional communities need to be assured Origin can fulfill this obligation adequately. QMDC asserts Origin's financial assurance must also take into consideration:

- the impacts of climate change and variability on the project's ability to fulfill environmental management plans and EA conditions;
- the temporary and permanent loss of ecosystem services;
- temporary and permanent surface and groundwater contamination; and
- potential impacts on the socio-economic well-being of regional communities caused by unsustainable CSG practices, both local and global.

4.2 Recommendations

4.2.1 **That Origin should fully disclose the details of their financial assurance and account for the above potential impacts.**

4.2.2 **Alternatively, if the fiscal amount of Origin's assurance is deemed confidential, then Origin should provide a disclosure and full description of the operational activities it proposes financial assurance for.**

5.0 Climate Change

5.1 The impacts associated with climate change are also related to changes in climate variability. Changes in both the magnitude and frequency of rainfall currently have unknown impacts on the water cycle associated with the QMDB catchment areas.

QMDC submits that the Application does not satisfactorily address what affect seasonal shifts in rainfall, temperature changes and evaporation will have on the Spring Gully development area infrastructure and operations.

5.2 Recommendations

5.2.1 **That Origin consult with climate change expertise (eg USQ, NCCARF) and audit the EMP against predicted climate change scenarios.**

5.2.2 **That DERM do not permit the project and trials to proceed without a climate change audit.**

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5.2.3 That all new construction must be situated where it will cause no harm to the environment due to flooding, drought and other extreme weather events and patterns.

5.2.4 That all construction sites must be operated in a manner that is prepared for extreme weather events and patterns.

5.2.5 That all infrastructure is designed to cause no impact to the environment due to extreme weather events and patterns.

6.0 Land Management

6.1 The below impacts will or may be caused by the project and trials:

1. Erosion due to soil type
2. Alienation of potential strategic cropping land
3. Land contamination

6.2 Soil management requires the CSG industry to view the soil as a finite resource and not a receiving medium for a whole range of toxic substances. Origin identifies a large number of activities that have the potential to cause land contamination. Best practice requires Origin to avoid and at the very least further minimize any land contamination. QMDC asserts the Application is therefore moving in the wrong direction.

In accordance with the *Strategic Cropping Land* legislation Origin's proposed development should avoid locating or impacting on strategic cropping land (SCL).

QMDC submits that thorough and detailed rehabilitation research programmes have not yet demonstrated that mining prime agricultural land is only a temporary cessation to agricultural production and that disturbed landscapes and soils can be reconstructed to pre-mine capability and productivity.

QMDC is therefore concerned that because of the number of activities proposed in this Application that either involve major soil movement, long term storage ponds or facilities or have inherent contamination risks then should the land associated with this Application be deemed strategic cropping land it will not be able to be reinstated or fully restored to strategic cropping land condition. The development would therefore permanently alienate rather than temporarily diminish productivity.

The risk is that development because it is likely to occur within existing and/or proposed food production areas will result in a fragmented landscape with inadequate buffers. Failure to protect agricultural areas will impact on landscape features that support agricultural systems, resulting in either complete losses of agricultural uses on affected lands or diminished productivity.

Protecting SCL and associated soils also requires addressing the need to protect water. If land achieves the versatile cropping land classification it is because of access to groundwater as well as cropping reliability etc.

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QMDC submit Origin's impact on SCL and agricultural land is an acceptable risk.

6.3 Recommendations

- 6.3.1 That DERM create a buffer zone to protect cropping capacity from the Spring Gully project and trials and address other landscape impacts on waterways.**
- 6.3.2 That "Fully restored" should mean restoration back to the parameters in the original land suitability assessment.**
- 6.3.3 That before any approval of development the capability of a site to be fully restored to SCL must be clearly determined and based on peer reviewed scientific evidence that supports this as possible.**
- 6.3.4 That Origin must demonstrate all of the below criteria:**
- 1. that there are no alternative sites;**
 - 2. that SCL can be fully restored back to original assessed condition as per all criteria within suitability assessment; and**
 - 3. the proposal is of significant community benefit.**

Each criteria should have equal value and it should not be an "either/or" condition.

7.0 Regional Ecosystems

- 7.1** QMDC asserts priority landscape scale regional ecosystems should be maintained or improved so that ecological processes and ecosystem linkages are increased in extent and abundance at priority catchment scales.

QMDC submits that the decline in populations of 'at risk' flora and fauna species must be prevented. Native fauna are territorial and cannot simply move to another area if disturbed by noise, dust etc. Origin's EMP must demonstrate scientific understanding of the importance of remnant vegetation and the habitat requirements of native fauna by preventing further fragmentation or destruction of ecosystem corridors. It should not be assumed fauna can be removed to another ecosystem if found where vegetation is to be cleared and that birds will simply fly away to somewhere else if disturbed by noise, dust etc. Origin's EMP must demonstrate scientific understanding of the importance of remnant vegetation and preventing further fragmentation or destruction of ecosystem corridors.

QMDC submits that destroying habitat before equivalent habitat has been restored increases the risk of species extinction. Additionally, species need time to colonise a restored habitat, and too frequent a turnover of habitat may increase the risk of species extinction.



QMDC posits that the long term conservation of biodiversity and the well-being of the region's communities depend upon both the protection of natural assets and maintaining the integrity of the ecological processes that sustain them. A focus on process recognizes that ecosystems are temporally and spatially dynamic and that the components of ecosystems interact in complex and diverse ways that contribute to, and sustain biodiversity. Processes may also act as selective forces to which particular species are constantly adapting.

QMDC argues that the Technical Report for the *Siting Assessment for Spring Gully Detention Pond* (Siting Assessment Technical Report) fails to understand the significance of the buffer zone. Modification or destruction of ecological processes are in practice, often irreversible and an ecosystem will not necessarily rehabilitate to its prior function.

The Siting Assessment Technical Report fails to respond adequately to the complexities in the ways in which threats affect ecological processes and regional ecosystems. For example:

- Impacts may occur far from the location of the initial threat or disturbance.
- Threats that affect one species may have cascading effects on other species.
- Environmental responses to a threat are not necessarily directly proportional to the level of threat (ie a linear response). Non-linear responses mean there are critical thresholds where small increments of change can result in dramatic shifts in the state of the system.
- There is often a time delay, from days to decades, between alteration to an ecological process and its full effects on biodiversity.
- Threats may have a combined impact greater than their independent effects.
- Complexities in interrelationships among species and chance environmental variation may mean that often there will be uncertainty about the effects of a particular threat on processes.

QMDC recognizes the value of the terrestrial and aquatic ecology studies already conducted in the Spring Gully development area. QMDC believes further study is required to ascertain which processes have the greatest influence in this area, their role, the spatial extent over which they operate, the kinds of threats that are limiting their function. This will assist the EMP to direct its management strategies where it will have the greatest impact and be most cost effective for Origin.

A fundamental tenet of regional ecosystems is recognition of the interaction between pattern and process. The identification and management of locations directly associated with a specific process is a practical way for Origin to protect regional ecological processes. Examples in the Spring Gully development area include:

- Protecting floodplains adjacent to river channels to maintain lateral hydrological connectivity and the ecological benefits of periodic flooding.
- Maintaining continuous vegetation along elevational gradients to enhance opportunities for altitudinal migration or range shifts in a changing climate.
- Protecting key wetlands & natural springs along the migration paths of waterbirds as critical stops for refueling.

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- Maintaining riparian vegetation to promote interactions between terrestrial and freshwater systems.
- Protecting small ephemeral streams and wetlands to aid the re-establishment of ecological process in restoration.

QMDC asserts that in relation to the infrastructure mapping and Environmentally Sensitive Areas and Regional Ecosystems and regrowth these are not adequately addressed in the management plan. QMDC submits that there would be scope to adapt the planning for the detention pond and associated infrastructure to avoid impacts on environmentally sensitive areas as mapped.

7.1 Recommendations

- 7.1.1 That the siting of the new detention pond and any associated infrastructure is not permitted to impact on high-conservation areas and remain outside the buffer zone.**
- 7.1.2 That Origin allocates land for habitat connectivity to allow species to move as climate zones change.**
- 7.1.3 That DERM identify to Origin the processes that are most important in sustaining the regional ecosystems (terrestrial and aquatic) and species in the Spring Gully development area.**
- 7.1.4 That Origin establishes a long term monitoring programme to measure environmental change and generate information on:**
- The direction and magnitude of change(taking into account natural fluctuation)
 - The rate of change
 - The pattern of the change response
- 7.1.5 That the construction of the infrastructure not be approved until a detailed site investigation is carried out and an official map modification is approved as per the Queensland Herbarium process giving accurate details of the regional ecosystem including the presence of any natural springs and their biodiversity.**
- 7.1.6 That Origin to make clear the infrastructure overlay and adapt the planning for wells and associated infrastructure to avoid impacts on environmentally sensitive areas as mapped and including of concern and endangered Regional Ecosystems (plus regrowth mapped for these RE's) and all natural springs.**

8.0 CSG Water Management

- 8.1** To date appropriate solutions for the reuse of CSG water have not been made available by Origin and indeed much of that water is ending up creating contaminated sites. A full cost environmental accounting of CSG water disposal requires social and economic issues to be addressed.

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The proposed options are still not providing viable solutions in the region for the volumes of CSG water being produced.

QMDC asserts that DERM, at the very least, when determining this Application needs to consider CSG water management against sustainable production levels. Dilution is not a sustainable solution, long term storage is not a sustainable solution, contaminating soils and water ecosystems is not a sustainable solution, landfilling is not a sustainable solution, disregarding buffer zones designed to protect environmental sensitive areas is not a sustainable solution.

The industry has been operating long enough to be required to produce independently peer reviewed scientific data to support all its EA applications and any proposed amendments. QMDC asserts this region's communities requires at the very least regional certainty that there will be no ongoing, long term or site specific or cumulative impact to receiving environments, whether land, water or vegetation. This requires not only independent reviews of technical reports supporting an application but also independent monitoring and assessments of the proposed practice.

DERM must consider this Application in terms of whether the region's communities are prepared to have an accumulation of contaminated sites or "stockpiles" of by-product to be dealt with once a future solution is found or washed away in floods or untreated CSG water released for emergency disposal? QMDC is concerned about CSG water management at the Spring Gully site particularly following a Google Earth observation of what seems like holding pond leakage and salt scalds below existing holding dams.

8.2 Recommendations

8.2.1 That Origin be required to produce independently peer reviewed scientific data to support all its EA applications and any proposed amendments.

8.2.2 That Origin and DERM guarantee that there will be no ongoing, long term or site specific or cumulative impact to receiving environments, whether land, water or vegetation resulting from the storage of CSG water in a new detention pond.

8.2.3 That DERM requires the independent monitoring and assessment of the proposed practice of storing CSG water in a detention pond.

9.0 Siting & Design of Detention Pond

9.1 "The current interceptor pond is insufficient to contain large rainfall events therefore it is proposed to replace this pond with a new larger Detention Pond."

Firstly QMDC would like to voice concerns (highlighted by Origin's above statement) from a regulatory and confidence perspective the inadequacy of planning and regulation around the original design and the influence that has in terms of our confidence in future developments and those approved in other areas.



Although the Siting Assessment Technical Report makes it appear there would be no significant impact from the pond infrastructure within the 500m buffer zone to the endangered ecosystem, there is no evidence or information provided that outlines what potential impacts may be nor any attempts by Origin to demonstrate or guarantee no impact.

The establishment of buffer zones to protect natural resources should not be over-ridden by this Application. The Application to site a detention pond within the established 500m buffer zone has not established an overriding need for the development in terms of public benefit and that no other site is suitable for the particular purpose. The arguments used are purely economic costs and potential human error of Origin's own technical staff.

QMDC acknowledges that there may be an increase in costs to Origin as a consequence of development at the alternative site proposed. QMDC asserts however that DERM should not support any more development within the established buffer zone when viable alternatives exist. In this case the buffer zone is protecting an Endangered Ecosystem which is a "no go zone" for development. Had it been a buffer zone protecting an Of Concern or Least Concern, Origin would be obligated to consider offsets. QMDC urges DERM to impose conditions that provide for the protection of ESAs and specifically identified natural drainage features, regardless of the effect of cost on a company's profits.

The preparation of technical reports and EMPs should include an evaluation of alternative forms of development, and significant weight should be given to those strategies which minimise the impacts on natural resources. Due consideration should be given to the protection of ESAs and waterways when there are applications for EAs including if it is an application to amend current conditions.

The argument that siting the pond within the pond is more viable based on the grounds of operational effectiveness of gravity feed, the arguably low risk due to the topography and avoidance of infrastructure does not in itself justify further encroachment on the ESA.

The siting should aim to avoid potential land use conflicts and long term impacts on regional ecosystems.

Origin 's Siting Assessment Technical Report did not offer adequate details of the proposed design of the new detention pond but only articulated the existing conditions they must abide by. QMDC therefore cannot ascertain whether the design proposed will adequately meet the requirements of the conditions as well as adopt best NRM practices relevant to the surrounding natural resources the pond will or has the potential to impact upon. At the very least QMDC would have expected the Siting Assessment Technical Report to address construction and management of the pond infrastructure within land capability (salinity, soil type etc).



9.2 Recommendations

9.2.1 That the selected site as per the Siting Assessment Technical Report is rejected.

9.2.2 That Origin be required to produce an independently peer reviewed scientific data to support another proposed selection site outside the buffer zone.

9.2.3 That details of the design, construction and management of the new detention pond be provided for public consultation.

10.0 Gas reinjection

10.1 QMDC asserts Origin and all CSG companies must plan for sustainable production of CSG and DERM must impose conditions that reflect this commitment to sustainable production, so excess production and gas reinjection is not necessary in the first instance. It would seem the practice of gas reinjection is due to excessive or accelerated production beyond the company's capacity to manage the gas. This lack of gas management capacity puts at risk a State owned asset. The trial to reinject gas poses in QMDC's opinion an unacceptable threat to a public resource, namely the extracted gas. QMDC understands that CSG companies do not own the gas but that it is a public resource.

The disposal or storage of CSG resulting from interruptions or ramp up management whether creating or risking the creation of more contaminated sites poses too high a risk to allow the Application to proceed. QMDC urges DERM to reject Origin's application owing to the risks identified by Origin associated with subterranean gas leaking, uncontrolled gas flow to the surface, aquifer contamination, unwanted faulting, which may result in serious injury or fatality. QMDC do not support hydraulic fracturing as a practice including for mitigation as proposed for gas reinjection in the Application.

Best practice requires proven scientific and technical solutions that assure there are no new site specific or cumulative environmental and socio-economic impacts. Infrastructure and associated industrial operations associated with disposal of CSG should be defined against specific criteria and limitations that mitigate the risks associated with the storage, transport, destination, loss of an economic resource, and cumulative and long-term impacts.

QMDC to date has never seen any model conditions devised for gas reinjection nor has it been party to any public forums to educate the public or regional communities on the process. QMDC has been informed by DERM that other companies perform gas reinjection. QMDC's engagement in the EIS and EA process has not seen to date any EA applications by any CSG company to do this as part of their operations. QMDC however has not read all CSG EA applications.



The Queensland Government has not provided the public or regional communities or key stakeholders with any fact sheets on the practice therefore we are alarmed by DERM recently informing us this is currently being practiced.

QMDC is concerned by Origin's statement that the *Spring Gully Gas Reinjection Trial Management Plan* (the TMP) is limited in scope to addressing risks associated with the gas reinjection pilot trial proposed... and that they do not need to apply for approval because they do not consider it "a petroleum activity at this stage of investigation/design phase" (SEE p.6 of the TMP).

QMDC therefore do not accept, that, the risk assessment, nor the preventative measures offered by the TMP, are an accurate consideration of all risks minor and major to the environment and human health and well-being including the region's economic sustainable development.

QMDC asserts the reinjection trial proposed by Origin must be subject to a thorough assessment process to ensure it meets rigorous environmental management standards.

10.2 Recommendations

10.2.1 The gas reinjection pilot trial is rejected because a full and accurate assessment of all minor and major risks to environment and human health and well-being including sustainable economic development of the region has not been considered.

10.2.2 That Origin be required to produce an independently peer reviewed scientific data to support all future applications to trial reinjection of gas whether it be a pilot study or any other gas reinjection activity.

10.2.3 That a fully explained business case which includes a full cost analysis around the gas management practices that cause the need for storing excess gas in the first instance is provided by Origin.

10.2.4 That DERM make publically available information outlining where gas reinjection activities are currently occurring or are proposed to occur and all conditions associated with those gas reinjection activities or trials.

10.2.5 That DERM make it publically known whether gas reinjection is a petroleum activity and what legislation holds jurisdiction over its practice.

10.2.6 That section 310V of the EPA is upheld requiring Origin to complete an EIS for all future proposed gas reinjection activities or trials.



11.0 Landspraying Drilling Fluids

- 11.1 QMDC is concerned that Origin's *Landspraying while drilling trial program* (the Landspraying Trial) does not comprehensively describe the composition of their drilling fluids and indeed down plays that composition by constantly referring to them as 'mud'.

QMDC understands that all of the water and associated muddy water that are used for drilling are by-products (Drilling by-products include drilling fluids (muds), drill cuttings, and wash water) from the drilling process. If these are collected, and the "muddy water" is put through a treatment to separate the solid materials in order for the water and solids to be disposed of separately - to what degree is the water to be treated and what volume of both the water and solids are to be disposed for the Spring Gully project?

QMDC asserts that the treatment and disposal may greatly depend on the CSG company and what is negotiated with the landholder (in the way of re-use of by-products). No separation or treatment, for example, may occur and the by-product directly sprayed to the receiving land (via trucks with spray rigs much like water spraying).

QMDC asserts these matters as noted in the Landspraying Trial need further consideration:

- The lack of specific legislation around disposal of drilling by-products from gas and oil industry means that new disposal methods will be open to interpretation of various non-specific legislation and guidelines. This opens the industry to self-regulation, the intention of a CSG company may be to set a high standard of environmental protection, however other companies may not perform to the same corporate standard leaving the environment open to potential harm.
- "There are no specific regulations governing drilling by-product management in Australia".
- "Code of Environmental Compliance for mining Condition 20 states that waste from the project area must not be directly or indirectly released from the project area to the environment, where, condition 29 states that drilling by-products should be disposed of down-hole or in a sump."
- "EP Act requires that a disposal permit be obtained from Department of Environment (DoE) before removal of contaminated soil from land that is recorded on the Environmental Management Register (EMR). Disposal permits are issued for a specified volume of soil and stipulate the place of disposal and any conditions relating to soil removal, treatment, and disposal. Given that drilling locations are not listed on the EMR and the drilling by-products are not classified as soils this guideline is loosely applicable because there is the potential that a negative impact may occur as a result of LWD."

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- “The main principal of the EPHC (2006) guidelines to LWD is that the reuse and recycling of industrial residues to land may occur only if they do not cause harm to the environment, human health, or agriculture. But the guidelines are limited to a select number of industries, which does not include the oil and gas industry.”
- Where chemicals or other substances are used during the drilling process (chemicals or salt may be used), this would be inappropriate for Landspraying and should be regulated accordingly, or that the by-products are treated to a suitable standard prior to disposal via any means.
- Bentonite and polymers used in the drilling process may be natural substances, however they are specifically used to manipulate the behaviour of soils (e.g. increase fluid viscosity, inhibit clay and shale swelling and sticking, and flocculate drilled solids (Zvomuya et al. 2008)). What issues would this cause to receiving soils in the disposal process?
- Landholders may add fertilisers or other additives for production improvement. Are there associated issues?
- “Landspraying on pasture or improved pasture land will be sprayed directly to the pasture and the drilling muds remain on the soil surface and on the vegetation. Drilling muds landsprayed on Origin crop land are not anticipated to be incorporated.”
- “Utilizing LWD may potentially adversely affect vegetation and soils. There could be negative effects to plants as a result of the physical coating of the drilling muds, possibly inhibiting photosynthesis, delay flowering, hinder seed set, or reduce the seed bank. Landspraying could negatively affect soil chemistry (pH, salinity, sodicity, or nutrients) or soil physical characteristics (water holding capacity, crusting which may inhibit seedling emergence) (Zvomuya et al. 2008). Therefore, understanding how to manage these potential impacts is important prior to undertaking any full scale implementation in Australia. Additional, treed habitats may be considered for LWD if they fit the criteria for LWD site selection and are able to support the equipment used”
- These impacts should be closely monitored in trials and lead to best practice and regulation of impacts, particularly with respect to land capability and risks.
- QMDC asserts the *Alberta Directive 50* which was developed by the Alberta Energy and Utilities Board (EUB), the Alberta Agriculture, Food and Rural Development, and the Alberta Environmental Protection Agency (EUB, 1996) relied on by Origin is inherently flawed. See *Guideline value application rate* below:

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- Chloride < 400 kg/ha
- Total Nitrogen < 200 kg/ha
- Boron < 5 kg/ha
- Cadmium < 1.5 kg/ha
- Chromium < 100 kg/ha
- Copper < 200 kg/ha
- Lead < 100 kg/ha
- Nickel < 25 kg/ha
- Vanadium < 100 kg/ha
- Zinc < 300 kg/ha

The below argument by Origin that using *Alberta Directive 50* provides the Landspraying Trial some legitimacy is not supported by QMDC.

“Although the Directive 50 may not be entirely suitable for Australian conditions, when evaluated as a whole, they are a useful drilling by-products characteristics against the proposed LWD approach for drilling by-products management.”

A focus on managing the drilling by-products together (drilling mud and cuttings), with criteria for loading rates, frequency of application, proximity to sensitive receptors and receiving soil quality allows Origin to ignore to a degree Australian and New Zealand Environment Conservation Council (ANZECC) short-term trigger value (STV) and long-term trigger value (LTV) guidelines for agricultural irrigation water (ANZECC, 2000); as these relate to the application of water over a continuous period of time.

- An examination of ANZECC exceedences highlights very quickly why Origin prefer to use the *Alberta Directive 50*.

Although according to the report offered by Origin (not independently peer reviewed) no drilling mud or drill cutting samples exceeded the *Alberta Directive 50* maximum application rates for any of the metal or metalloid constituents, where guideline values exist, the *Alberta Directive 50* guideline for SAR was exceeded suggesting that it may cause structural problems to receiving soils. Adding gypsum is given as the solution.

“Concentrations of aluminum, arsenic, boron, iron, manganese, molybdenum, and vanadium in the Talinga 50 mud samples exceeded the ANZECC (2000) LTV guidelines for irrigation water.

Concentrations of aluminum and iron also exceeded the ANZECC (2000) STV guideline in some samples.

Nine of the fourteen drilling mud samples collected exceeded the LTV for aluminum. Six of these samples also exceeded the STV.

Iron concentrations exceeded the LTV in 12 of the 14 mud samples collected. Three of these samples also exceeded the short-term trigger values.

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Molybdenum concentrations exceeded the LTV for all drilling mud samples (14) collected, including the sample taken from the mud tank prior to the commencement of drilling.

Boron concentrations exceeded long-term irrigation guidelines for 4 samples collected from the Lower Juandah and Taroom Coal Measures, and the Eurombah Formation.

Out of the 14 samples collected a small number of samples were found to exceed the LTV for arsenic (2 samples), manganese (1 sample), and vanadium (2 samples). These exceedences came from samples collected from the Westbourne and Springbok formations, Macalister seam, and Macalister seam and Taroom Coal Measures, respectively.”

The report also acknowledges that “detectable concentrations of petroleum hydrocarbons were observed in drilling muds and not the source waters from both sites. The C6–C9 fraction, which consists of the benzene, toluene, ethyl benzene and xylenes (BTEX), may pose a risk from an environmental and human health perspective.”

QMDC notes that there is no measurement or discussion of radioactive substances such as radioactive tracer beads or strontium, which could be expected.

An assessment of the drilling fluids in the drilling mud is not included and the toxic chemicals used are not included in suggested parameters. The Program merely states:

“If a mud additive from any one of the nine categories listed above is used in the drilling fluid system, the potential toxicity of the mud system must be assessed.”

- The report’s risk assessment makes no effort to assess the “potential toxicity”.
- The report when referring to drilling fluids used by Origin talks about water based muds (WBM) and makes the comment that “most WBM used by Origin contain only a few components, which are added in small amounts to change mud properties to solve specific down-hole problems” but could be any of the following listed in Table 2-1 Functional Categories of Materials used in Drilling Muds.

QMDC has been informed that the following chemicals from this table are either hazardous(*) or are in some cases hazardous:

- **Viscosifiers** - Increase viscosity of mud to suspend cuttings
 - PAC R, (Cellulose derivative) Bentonite, AUSGEL (bentonite 1302-78-9 >98 polyacrylamide*)



- **Bactericides/biocides** - Prevent biodegradation of organic additives. Control or eliminate the bacteria in the water storage tanks - Bleach and green-cide (Glutaraldehyde*)
- **Corrosion inhibitors** - Prevent corrosion of drill string by formation acids and acid gases - zinc carbonate (products of degradation are more toxic.)
- **Defoamers** - Reduce mud foaming - Defoam-X (Glycol Blend 60-100 % - no CAS*)
- **Emulsifiers and de-emulsifiers** - Facilitate formation of stable dispersion of insoluble liquids in water phase of mud. De-emulsifier used to break emulsions- Versamul® (Fatty acids derivatives 40 - 80 Petroleum distillates, hydro-treated light 64742-47-8 20 – 60, Polyamide*)
- **Lubricants** - Reduce torque and drag on the drill string – Idlube (??), Lube 100 (Polyether polyol 100 %)
- **Surfactants/Foaming agents** - Facilitate formation of stable dispersion of insoluble liquids in water phase of mud - Drilling detergent (???)
- **Shale control inhibitors** - Control hydration of shales that causes swelling and dispersion of shale, collapsing the wellbore wall - IDCAP (polymeric shale inhibitor – NO MSD Provided on web) - Polyplus, (Anionic polyacrylamide 20 – 40, Petroleum distillates, hydrotreated light 64742-47-8 -20 – 40%*)

The MSD states:

Toxicological Information:

Do Not Use. Use TXINF019. This product may contain trace amounts (<0.1%) of acrylamide. The International Agency for Research on Cancer (IARC) has designated acrylamide a Group 2A (probably carcinogenic to humans). This designation was based on sufficient evidence in experimental animals for the carcinogenicity of acrylamide (IARC Vol. 60, 1994, p. 389).

The National Toxicology Program (NTP) classifies acrylamide as "reasonably anticipated to be a human carcinogen" based on sufficient evidence of carcinogenicity in experimental animals (10th Annual Report on Carcinogens, 2002). Acrylamide is a possible mutagen (promotes a mutation (change in chemistry of a gene)) (IARC Vol. 60, 1994, p. 389). This product may contain trace amounts of acrylamide (< 0.1%). Acrylamide has been classified by the International Agency for Research on Cancer (IARC) as a Group 2A carcinogen (probably carcinogenic to humans) and a suspect carcinogen by the National Toxicology Program (NTP).

- **Polymer stabilisers** - Prevent degradation of polymers to maintain fluid properties.- Sodium sulfite (Very hazardous*)

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- **Breakers** -Reduce the viscosity of the drilling mud by breaking down long chain emulsifier molecules into shorter molecules - Chembreak (citric acid plus enzymes)
- The Landspraying Trial lists the possible effects of these as follows:

“Environmental and Human Health Hazards of Drilling By-Products

Drilling by-products may present an environmental and health risk as a consequence of the additives (i.e. individual components) introduced into the drilling mud and the chemical composition of cuttings.

4.1 Environmental Hazards

Environmental hazards associated with drilling by-products include potentially toxic additives, salt compounds, heavy metals, hydrocarbons, pH-control additives, and total suspended solids (TSS).

4.1.1 Salt compounds

Salt compounds from the drilling fluid and the cuttings can inhibit plant growth by disrupting the ability of plants to uptake water. Increased salt concentration in fresh water can also be toxic to fish, plants, and other aquatic organisms (Bright and Addison, 2002; Arthur and Leuterman, 1992).

4.1.2 Heavy metals

Heavy metals from both the drilling fluid and the formation tend to react with drill solids and clays and are not very mobile in the environment. They will not biodegrade and in some instances bioaccumulate and be passed up the food chain causing health problems, such as birth defects (Arthur and Leuterman, 1992).

4.1.3 Organic wastes

Organic wastes such as petroleum hydrocarbons can increase oxygen demand load on streams and rivers and carry diseases (Arthur and Leuterman, 1992).

4.1.4 Acids and Bases

Acids and bases (used for pH-control) can be detrimental to biota. pH shock from improperly disposed drilling wastes, whether liquid or solids, will disrupt ecosystems immediately (Arthur and Leuterman, 1992).

4.1.5 Total suspended solids

Total suspended solids can impact receiving surface water by reducing the amount and the quality of available light necessary for plant growth. This additional loading also affects the fauna through mechanical toxicity. The increase suspended solids contain organic fractions which, as they degrade, diminish the surrounding waters of oxygen (Arthur and Leuterman, 1992).

4.2 Human Health Hazards

The most common health hazard associated with drilling fluids is contact dermatitis (International Petroleum Industry Environmental Conservation Association (IPIECA), 2009). However, drilling muds (or fluids) may present a range of other health hazards depending on the exposure pathway.



4.2.1 Skin Contact

Upon skin contact to drilling fluids, the skin may become irritated. The symptoms and the seriousness of the condition vary and are dependent on the type and length of exposure to the drilling fluid and the susceptibility of the individual (IPIECA 2009).

Skin irritation can be associated with petroleum hydrocarbons, which may be present in the drilling fluid. In addition, several drilling fluid additives may have irritant, corrosive or sensitising properties (IPIECA 2009). For example, zinc bromide is corrosive whilst a polyamine emulsifier may have sensitising properties.

The contact dermatitis hazards associated with known additives used by Origin are as follows:

- AUS-GEL is believed to cause minor irritation.
- Biocides are known to be corrosive to the skin. Brief contact causes irritation whilst chemical burns can occur if not promptly removed. Staining is also a concern with long-term exposure.
- Skin contact with PAC-R is not expected to cause prolonged or significant irritation. It is not expected to be harmful to internal organs if absorbed through the skin.

4.2.2 Inhalation

Drilling operations often involve the circulation of drilling fluids in an open system at elevated temperatures with agitation that can result in a combination of vapours, aerosols, or dust above the sump (IPIECA 2009).

The main inhalation risks associated with the additives used by Origin are:

- Prolonged inhalation of silica dust related to Aus-Gel has been known to **cause silicosis** and other effects.
- Biocide inhalation may cause severe irritation of the nose, throat, and respiratory tract. Repeated, or prolonged, exposure may cause productive cough, running nose, bronchopneumonia, pulmonary edema, and reduction of pulmonary function. Aspiration into the lungs may occur during ingestion or vomiting, resulting in lung injury (chemical pneumonia).
- Inhalation of PAC R dust may produce mechanical irritation to the mucous membranes of the eyes, nose, throat, and upper respiratory tract.

4.2.3 Eye Contact

Specific drilling fluid additives may be corrosive or irritating to the eyes (IPIECA 2009). Common hazards associated with the additives used by Origin through eye contact are:

- AUS-GEL, which may cause mechanical eye irritation if dust is excessive.
- Biocides, which can be extremely corrosive and contact with eyes will cause conjunctivitis (redness and swelling of conjunctiva). Severe corneal injury may occur, with possible permanent impairment of vision.
- PAC R is not expected to cause prolonged or significant eye irritation. The material is dusty and may cause mechanical irritation and scratch the surface of the eye.



4.2.4 Ingestion

Drilling fluids are not intended for ingestion and consequently it is considered an unlikely risk compared to other routes of exposure. Some additives; however, do present a health hazard. The health effects that may arise from ingestion of the drilling fluids used by Origin are:

- The health effects associated with ingestion of AUS-GEL are unknown
 - Biocide causes severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhoea and perforation of the esophagus and stomach lining may occur.
 - PACR is not expected to be harmful if swallowed.”
- QMDC asserts that the information on impacts (informal hazard assessment), does not attempt to look at possible exposure to stock, native fauna, or humans, apart from a comment that the site would be checked to ensure no animals were present.
 - QMDC argues that no effective risk assessment has been carried out despite the presentation of risk assessment software calculations and the very qualitative risk assessment workshop between the consultants and company staff. Additionally QMDC argues a step is missing is the risk management process in relation to NRM and best practices, namely an assessment to whether the cumulative impact of the risks are too high to allow the Landspraying Trial to proceed.
 - Origin at the very least when they ask the question “What is Risk?” should seriously consider the cumulative impacts and risks associated with the Program, which include *spatial extent impacts* – those which occur over an area; *spatial intensity impacts* – when a location is impacted on by the activities of multiple sites; *simple temporal impacts* when impacts have a specific time of commencement and a measured form over time; *offset temporal impacts* when multiple simple temporal impacts are superimposed upon one-another over time; *linked triggered impacts* when one impact, either by its occurrence or by reaching a threshold level, triggers another impact that would not otherwise have occurred. The second impact is the triggered impact.
 - QMDC does not accept the assessment of environmental risk based on 2 ecotoxicity tests; lettuce germination and growth and earthworm survival as adequate for the purposes of the proposed CSG activity. The conclusion stated below is therefore inherently flawed because it did not test for other contaminants or measure their bioaccumulation in the soils, plants or earthworms. It should therefore not be relied upon in the decision to allow the Landspraying Trial to proceed.



“The 14-day earthworm (*Eisenia fetida*) toxicity test results suggest that the drill cuttings (from Talinga 50) are not expected to be toxic to earthworms, with only 1 of the 14 samples tested (T550) showing a significance difference in earthworm mortality compared to controls, which did not contain an applied Layer of drill cuttings. “ and while “Talinga 50 drill cutting may inhibit lettuce seed germination, it does not have an appreciable effect (due to the water-soluble constituents) on early growth biomass once germinated. Therefore, the Talinga 50 drill cuttings, applied as a surface layer up to 0.005m thick, did not physically inhibit the emergence of lettuce seedlings, nor were they found to be toxic to lettuce seeds.”

11.2 Recommendations

11.2.1 That the trial be rejected in its entirety because of insufficient data on ecotoxicity/bioaccumulation risks (no native species other than earthworms, no native plant species), potential for environmental contamination (e.g. soil residues, pollution of air and water) with persistent heavy metals, salt, hazardous drilling fluids and failure to consider contaminants such as radioactive substances.

11.2.2 That section 310V of the EPA is upheld requiring Origin to complete an EIS for all future landspraying while drilling activities or trials.

12.0 Technical Maps

12.1 QMDC is alarmed by the inadequacy of the submitted technical reports. This includes the quality of data, the associated mapping, relevant and important information being excluded e.g. basic latitude and longitude reference points, full assessment of environmental risks, comparative literature review studies to qualify literature reviews where data is lacking, the dumbing down of definitions e.g. drilling “fluids” referred to as drilling “mud”.

QMDC argues such disregard for community intelligence and commitment to be an active participant in the technical and scientific fields of knowledge pertaining to soil science, hydrology, hydro-geology, natural resource management, social science etc indicates not only Origin’s disregard for community participation and involvement in the development of the CSG industry in the QMDB but also highlights the lack of scientific and technical integrity of the reports and science used by Origin to support the Application.

12.2 Recommendations

12.2.1 That all technical reports and science used to support the Application be rejected.

12.2.2 That all future technical reports and science used to support any EA applications or applications to amend existing EAs be subject to independent peer reviews.



13.0 Independent Peer Review of Scientific Reports

13.1 QMDC submits that although DERM as the regulator plays the “last card” on “*acceptable risk*”, initial determinations are not the prerogative of a private CSG company nor any scientific researchers it pays to conduct research both with commercial interests in the outcome.

It is common practice that company based risk assessments, are frequently deemed confidential, do not incorporate regional NRM targets, do not respect local knowledge, depend too much on economic modeling which lacks peer review or environmental and social application and do not advocate a community participatory process or a precautionary approach.

The scientific reports relied upon by Origin for the Application weaken the intentions of the *Environmental Protection Act* by merely suggesting “preventative measures” which are based on a limited scope to address risks associated with the gas reinjection.

If the primary objective of the *Environmental Protection Act* is to improve the total quality of life, both now and in the future by maintaining ecological processes on which life depends then in relation to the Application the science and technical expertise relied upon should be as a matter of routine independently peer reviewed in order to provide the best available science and knowledge to protect, public health, aquifers or waterways. Clearly because gas reinjection or landspraying of drilling fluid carry a risk of environmental or ecological impact this is a given. The vast majority of contaminants associated with landspraying for example have had no trigger values set by ANZECC due to ‘insufficient data’ and research. More opinion is therefore required to base sound practice on.

13.2 Recommendations

13.2.1 That all technical reports and science used to support the Application be rejected.

13.2.2 That all future technical reports and science used to support any EA applications or applications to amend existing EAs be subject to independent peer reviews..

14.0 Cumulative Impacts

14.1 The Application does not address the cumulative impacts the new development and associated operations will have on the site as a whole, for example, the impacts on the ephemeral nature of the unnamed tributary, the quality and quantity of groundwater, the ongoing fragmentation caused by the development on the terrestrial ecosystems, residual risks from gas and water treatment by-products, accelerated consumption of a finite non-renewable resource etc. and the social, economic and environmental stresses caused by the construction and operation of associated infrastructure. Nor does it address the impacts caused by the whole of the CSG industry on the Great Artesian Basin, on the total air quality of the region, on the soils of the region and so forth.

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14.2 Recommendations

14.2.1 That a cumulative impact assessment be done to illustrate the totality of impact caused by the total footprint of the current Application, of the existing Origin operations in the QMDB, and of the whole CSG industry in the QMDB.

14.2.2 That section 310V of the EPA is upheld requiring Origin to complete an EIS for all future proposed gas reinjection activities or trials.

15.0 Public Notification & Consultation & the Use of Trigger Maps

15.1 Community engagement, disclosure of information and public consultation must meet community expectations for a more enduring and direct role in the planning, decision-making and implementation of natural resource policies and activities as they relate to CSG projects.

This process still needs improving to ensure timely and adequate notification of proposed developments, particularly to individual landholders, local governments and communities where the development and associated developments have the potential to impact on the planning and resourcing of supporting infrastructure, services and land use e.g. farming, Industrial and residential zoning, waste management, sewerage management, roads, infrastructure, services (health, police, schools), airports, and emergency services.

QMDC submits that public engagement that is timely, meaningful and relevant and conducted appropriately for each stakeholder will encourage and facilitate active public consultation. This also includes public notification and consultation for any proposed changes to EAs or EMPs.

15.2 Recommendations

15.2.1 DERM to create trigger maps which highlight to EA applicants or proponents of development key stakeholders potentially affected by the EA application and its associated projects or activities or who have an interest in the region or area likely to experience some kind of impact e.g. Regional NRM organisations, Landcare groups, Catchment Management Associations, conservation groups, peak industry organisations, local government, key community groups etc. CSG companies would then be obligated to notify these identified stakeholders of their EA applications.



16.0 Key Stakeholder Meetings

16.1 QMDC is a community-based, not-for-profit organisation that delivers NRM services across the QMDB. QMDC staff work with the Traditional Owner Elders, Elders and Seniors of the countries (Nations) in the region and a wide range of other natural resource managers, including Landcare groups, conservation groups, farmers and graziers, regional councils, agencies from all tiers of government, agricultural industry bodies, agribusiness, the corporate business sector, the mining and resource sectors, the health sector and communities.

QMDC in partnership with Landcare groups works directly with hundreds of landholders; assisting in changing management practices on thousands of hectares; leads and contributes key service abilities to fill knowledge gaps; contribute to NRM policy developments at regional, state, national levels; and facilitate greater access to information by many community organizations.

QMDC is therefore well placed to strongly represent the QMDB, and achieve policy and legislative positions that balance developments with sustainable NRM. QMDC would therefore assert the opportunity for regional communities and organisations to assist DERM's Petroleum and Gas Unit, both the policy and assessment arms, with EA application assessments, drafting model conditions and broader policy should be supported by DERM. QMDC's NRM expertise and regional networks provide an invaluable opportunity to facilitate and engage the region's communities in the current and long term sustainable management of the region's natural resources.

16.2 Recommendations

16.2.1 That QMDC and the Petroleum Gas Unit meet to explore how the Unit and QMDC can coordinate a consultation process that better engages the communities of the QMDB and its key stakeholders.

16.2.2 That DERM initiate a discussion paper or public forums that seek input from the public and regional communities on the mining and energy industry and how community consultation can be best facilitated with in a regional partnership and collaborative process to determine best industry practices within the QMDB .