

Advice to decision maker on coal seam gas project

IESC 2017-089: Alfredson Block CSG Project (EPBC 2017/7902) – Expansion

Requesting agency	The Australian Government Department of the Environment and Energy
Date of request	4 October 2017
Date request accepted	4 October 2017
Advice stage	Assessment

Summary

The Alfredson Block CSG Project (the proposed project) is a proposed coal seam gas (CSG) extension project approximately 16 km south-east of Condamine, 45 km south of Miles and 35 km northwest of Tara in south central Queensland. The extension involves the installation of 68 CSG wells, drill pads, access roads and water gathering and flowlines, with an operational life of approximately 40 years. The proposed project disturbance area is approximately 208 ha within a 3,821 ha project area.

The proposed project is located on the south-western edge of a region with significant CSG development. The IESC considers potential impacts of the installation of an additional 68 wells will include an incremental decrease in groundwater pressures in important aquifers within and near the proposed project area. The IESC notes that some risks associated with various chemicals to be used during the proposed project, for example associated with chemical mixture toxicity, have not been identified or assessed and therefore have not been demonstrated to be appropriately managed.

The IESC has identified a few key deficiencies in the assessment, which are detailed in this advice. To address these deficiencies the proponent should provide:

- site-specific hydrogeological conceptualisations supported by data and information gathered from within or near the proposed project area;
- improved numerical groundwater modelling, parameterised and guided by the above conceptualisations and data, which can then be used to support the consideration of cumulative groundwater impacts;
- additional chemical assessments that were not included in the draft assessment documentation; and,

- plans to manage the long-term (post-closure) storage of potentially contaminated salt to give confidence that management is feasible and low risk.

Specific details on the above matters are discussed within this advice in the responses to the questions posed by the Commonwealth regulator.

Context

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) was requested by the Australian Government Department of the Environment and Energy to provide advice on the Australia Pacific LNG Pty Ltd's (the proponent) Alfredson Block CSG Project in Queensland.

This advice draws upon aspects of information in the draft Preliminary Documentation (PD), together with the expert deliberations of the IESC. The project documentation and information accessed by the IESC are listed in the source documentation at the end of this advice.

The proposed project is a 68-well extension to the proponent's existing Condabri coal seam gas tenements. The target coal seams are the Walloon Coal Measures and the proponent states that hydraulic fracturing of between 30 and 60 wells may be required. Some wells are likely to be horizontally drilled.

The proposed project is located in the Surat Cumulative Management Area (CMA) in Queensland. The Surat CMA contains a number of existing and proposed large-scale CSG developments. Modelling of cumulative groundwater impacts within the Surat CMA is undertaken by the Office of Groundwater Impact Assessment (OGIA) who publish their findings in the Underground Water Impact Report (UWIR). The proposed project is incorporated in modelling undertaken for the most recent UWIR (State of Queensland, 2016a; State of Queensland, 2016b).

Key Potential Impacts

Key potential impacts of the proposed project include:

- changes to groundwater level and pressure within aquifers overlying the Walloon Coal Measures. The extent and magnitude of the change cannot be accurately predicted at the local scale using the analytical groundwater model presented in the draft PD; and,
- cumulative reductions in groundwater level and pressure at some landholder bores and groundwater-dependent ecosystems (GDEs).

There are some risks that have not been assessed due to limited information on the persistence, bioaccumulation and toxicity, including mixture toxicity, of some drilling and hydraulic fracturing chemicals as well as limited assessments of some exposure pathways. Monitoring and data is needed to adaptively manage the risk of vertical connectivity of hydraulic fracturing.

The cumulative impacts of broad-scale land application of drilling muds using the landspray while drilling (LWD) method have not been assessed. While the risks to water resources from LWD from this project alone are low, the effect of numerous CSG developments will multiply the risks and potential for cumulative impacts to water resources near any areas used to dispose of drilling muds.

Response to questions

The IESC's advice, in response to the requesting agency's specific questions is provided below. The responses to questions 1 and 2 are combined due to their complementary nature.

Question 1: Can the Committee provide comment as to whether the information provided in the draft preliminary documentation is adequate to assess the project's impacts and support the proponent's conclusions in relation to these impacts?

Question 2: If further information is required, can the Committee identify the additional information necessary to assist in the assessment of impacts to water resources that may result from this project?

1. Components of the draft PD need to be improved to both enable adequate assessment and to verify the proponent's conclusions. In the following three sections, the IESC identifies further information necessary to assist in the assessment of impacts on groundwater, surface waters and GDEs.

Groundwater

2. Given this project is an extension and adjacent CSG activities have been operational for some time, the proponent should have substantial groundwater pressure, flux, water table level and geological data. The inclusion of this data in the assessment is needed to verify the proponent's groundwater modelling and the conclusions drawn on groundwater impacts.
3. The proponent has described the hydrogeological processes and controls within the proposed project area. However, the analytical groundwater model does not incorporate a number of important aspects of the hydrogeology presented in the conceptualisation, as detailed below.
 - a. The analytical groundwater model does not simulate potential impacts to the Bungil Formation, Mooga Sandstone, Orallo Formation or Gubberamunda Sandstone which are utilised by nearby landholders. This is because the conceptualisation assumes the Westbourne Formation is an effective aquitard (PD, p. 54); however, this has not been demonstrated with site-specific data.
 - b. The base case model uses hydraulic conductivity values for the Westbourne Formation, Springbok Sandstone and the Walloon Coal Measures that are lower than, or on the lowest end of, the range of measured values presented in the UWIR (Figure C-1, State of Queensland, 2016b). The storativity parameter for the Springbok Sandstone is assumed to be 4.5×10^{-4} in the absence of site specific measurements (e.g. gathered using the method described by David et al., 2017). Setting an overly high storativity value would reduce the amount of drawdown experienced in the Springbok Sandstone per unit of water extracted. The combined influence of low hydraulic conductivities and a high storativity causes the groundwater model to potentially under-predict the magnitude and extent of drawdown.
 - c. The model assumes each layer has the same hydrogeological behaviour across its entire distribution (i.e. a single hydraulic conductivity and storativity applied for each model layer). Therefore the model does not represent the inherent variability (heterogeneity) within these layers. Consideration of heterogeneity is important because known compositional variations within the hydrogeological units could potentially facilitate or limit the propagation of groundwater impacts to important local aquifers or landholder bores.
 - d. The sensitivity analysis undertaken on the groundwater model tested a range of hydrogeological parameters, including varying hydraulic conductivity in the aquitards and Walloon Coal Measures by one order of magnitude (increase and decrease). For most of the aquitard layers of the analytical model, these changes do not encompass the range of measured values presented in the 2016 UWIR (Figure C-1, State of Queensland, 2016b) and so may underestimate the level of impact. Failing to vary the hydrogeological parameters by their measured ranges means the analytical groundwater model is unable

to represent the potential maximum range of groundwater impact propagation into overlying or underlying aquifers.

- e. The model does not represent the Leichhardt-Burunga Fault. According to the proponent, the main fault slip surface does not extend into the Jurassic-aged rocks. However, reactivation of the Leichhardt-Burunga Fault and the folding in strata overlying the fault have resulted in smaller scale faulting which appears to cross-cut the Walloon Coal Measures (PD, p. 58). These smaller scale faults have the potential to influence groundwater flows in any of the planes vertical to, parallel to and/or perpendicular to the faults (e.g. as described in Bense et al., 2013). The presence of gas and hydrocarbons suggests connectivity potentially exists between hydrogeological units overlying and underlying the Walloon Coal Measures. Similarities in the presented electrical conductivity data (p. 60, Table 13) for units above and below the Walloon Coal Measures also suggest some connectivity between these units. It is possible that vertical connectivity is facilitated by geological structures, and this should be tested.
4. As a consequence of the matters identified in paragraph 3, the proponent's existing analytical groundwater model cannot simulate the range of potential groundwater impacts. To resolve this will likely require an improved 3D transient model constructed using additional data and information and in a numerical, rather than analytical, groundwater model framework.
 5. The proponent should provide information to address the matters raised in paragraph 3 and 4 to assist in assessing potential groundwater impacts. Measures and information should include:
 - a. consideration and presentation of a range of smaller scale, site-specific hydrogeological conceptualisations of the Westbourne Formation and Springbok Sandstone that take account of lithological heterogeneity, local seismic reflection data, drilling data, geological structures and incorporates all hydrogeological and stratigraphic units within the proposed project area;
 - b. using site-specific geological and hydrogeological data to support the range of model parameters chosen. This should include provision of the range of hydraulic conductivity, storativity and porosity values measured near the project area and where they were measured (if available). The choice of hydrogeological unit thicknesses used in the model should be supported by evidence from bore logs;
 - c. undertaking an improved sensitivity and uncertainty analysis of the updated model that includes varying key parameters, such as horizontal hydraulic conductivity, vertical hydraulic conductivity and storativity within their measured range of values and that are at representative of appropriate spatial scales; and,
 - d. improving groundwater modelling to simulate potential spatial and temporal variability in hydrogeological layers.
 6. Should this modelling indicate that impacts in units above the Westbourne Formation could potentially occur, then appropriate monitoring is required. This should include monitoring of hydraulic head variability through the geological sequence above the Walloon Coal Measures to provide realistic estimates of hydraulic gradients.
 7. The proponent has existing operations in the region. However, limited groundwater quality data has been provided. For example, Table 14 (PD, p. 62) only provides a single measurement of iron and manganese from a number of bores. Further groundwater quality data should be provided including data for the *initial* parameter suite identified in the proponent's groundwater monitoring plan (PD, App. 11, section 3.3.2). Providing statistical ranges of the data would help support the proponent's assessment.

Surface Water

8. In general, the proponent's management of co-produced water effectively reduces risks to nearby surface water resources. However, untreated co-produced water may be used for project activities such as dust suppression. The proponent should provide the data to confirm that the quality of this water will not degrade the environmental values of water resources near the location of these activities, especially in the long term.

Groundwater dependent ecosystems

9. The IESC notes that the GDE Atlas (Commonwealth of Australia, 2017) and the Queensland WetlandInfo (State of Queensland, 2017) online resources both show the presence of wetlands and other potential GDEs within or near the proposed project area.
10. The proponent's assessment of potential impacts to GDEs is limited to springs (PD, p. 64 and PD, App. 10, p. 46). While the potential risk of impacts to springs (Type 2 GDEs, *sensu* Richardson et al., 2011) from this project is likely to be lower than those from surrounding CSG projects, the proponent's assessment lacks information needed to identify potential impacts to Type 1 GDEs (e.g. aquifer ecosystems) and Type 3 GDEs (e.g. terrestrial vegetation that depends on groundwater fully or occasionally) (Richardson et al., 2011). Under the 'water trigger', the 2013 amendment to the *Environment Protection and Biodiversity Conservation Act 1999*, the protection of water resources is not limited to listed threatened species and communities. Therefore, a broader assessment of potential impacts to GDE water resources is needed.
11. The proponent should provide a detailed GDE assessment undertaken using a systematic approach that includes:
 - a. consideration of the co-location of vegetation and areas of shallow groundwater using site-specific hydrogeological conceptualisations;
 - b. utilising the groundwater model following completion of the improvements listed in paragraph 5 (i.e. incorporation of hydrogeological units that outcrop in the project area or are shallow enough to potentially support vegetation);
 - c. incorporating updated groundwater impact predictions (refer paragraph 5), and maps that show current and predicted depths to the water table in the Cainozoic sediments in and near the project area;
 - d. undertaking field investigations to ground-truth any potential GDEs and evaluate their ecological condition; and,
 - e. applying techniques from, for example, the Australian GDE Toolbox (Richardson et al., 2011) and Eamus et al. (2015) to confirm groundwater use by vegetation and groundwater discharge to surface water bodies, and use the approach recommended in the Department of Science, Information Technology and Innovation guidelines (DSITI, 2015) to assess potential impacts to Type 1 GDEs.

Question 3: Can the Committee comment as to whether the draft preliminary documentation provides adequate consideration to this project's contribution to cumulative impacts associated with other CSG and mining activities in the area?

Groundwater

12. The proposed project was included in the cumulative groundwater impact modelling undertaken for the 2016 UWIR (State of Queensland, 2016b). Using the most recent version of the UWIR is

therefore appropriate to support the assessment of the proposed project's contribution to potential cumulative groundwater impacts at the regional scale. According to the proponent, the project is predicted to have a maximum cumulative impact of 0.1 per cent of drawdown in a single bore screened in the Springbok Sandstone throughout the project life (PD, App. 10, p. 46).

13. The proponent assesses the proposed project's cumulative contribution to impacts on landholder bores in the Springbok Sandstone, Walloon Coal Measures and Hutton Sandstone. Consideration of cumulative groundwater impacts should be jointly informed by the modelling approach recommended in response to Questions 1 and 2. The proponent needs to identify potential impacts to all hydrogeological units and all bores within and near the project area. This should include the Bungil Formation, Mooga Sandstone, Orallo Formation and the Gubberamunda Sandstone and all bores that potentially access groundwater from these hydrogeological units. The proposed project's potential long-term impacts and groundwater recovery following the end of operations should also be represented in the model.

Salt and brine management

14. Based on the modelled water production rates, the cumulative quantity of salt expected to be produced by the proposed project is approximately 5,000 tonnes (PD, p. 43). Permanent storage facilities are not anticipated to be operational for approximately 20 years (PD, p. 43). The IESC acknowledges the use of various standards in brine management; however such long-term storage does constitute a residual risk, particularly from leaks and seepages. Brine may also include other contaminants, such as metals, hydrocarbons and radionuclides, particularly if filtration plant solids are disposed of in the brine ponds. The residual risks can be managed by monitoring and the use of a Trigger Action Response Plan (TARP).
15. Large-scale CSG extraction has been occurring in the region surrounding the project area for approximately five years. According to the proponent the only feasible option for long-term management of solid salt is within a regulated waste facility. Given this is the preferred long term management strategy (PD, App. 8, p. 68), a preliminary design and description of available technologies need to be included in the assessment to give confidence that this approach will prevent any long-term legacy impacts.

Groundwater dependent ecosystems

16. The proponent's draft PD assesses potential cumulative impacts to springs but not to other aquatic or terrestrial GDEs. The 2016 UWIR model is not appropriate to assess impacts to potential GDEs because it does not specifically simulate groundwater impacts in the shallow alluvial aquifers that GDEs in or near the project area would be likely to utilize, and because the regional scale of the model construction is too coarse to predict fine-scale, site-specific impacts.
17. The proponent should assess the proposed project's cumulative contributions to impacts on all three types of GDE. This assessment should be supported using the GDE identification process described in response to Questions 1 and 2. According to the GDE Atlas (Commonwealth of Australia, 2017), various aquatic and terrestrial GDEs that source groundwater from the alluvial aquifers potentially occur near or within the proposed project area.

Landspray while drilling

18. The proponent proposes to use their existing Landspray While Drilling Procedure (LWD) document (PD, App. 7) and has provided the results of a trial LWD operation undertaken near the project area (PD, App. 6). The trial examined effects from a single LWD application per area. However it is not clear if consecutive LWD applications are proposed to occur, or are permitted under the proponent's Condabri Environmental Authority (EA) (PD, App. 2 conditions G21 to G25). The proponent should state if it is proposed to undertake more than one LWD application

on any areas and if these areas would also be used for LWD by other CSG operations. If repeat application is proposed, the proponent should assess potential cumulative impacts associated with the accumulation of contaminants from drilling muds, such as salts, metals, total petroleum hydrocarbons, and other organic compounds in surface water and groundwater.

Question 4: Can the Committee provide comment as to whether the information provided regarding chemicals that will be, are likely to be or may be used throughout this project is adequate to identify and mitigate any potential risks with either their use or disposal?

19. The proponent has provided detailed risk assessments for hydraulic fracturing chemicals and drilling chemicals. While this information helps assessment of the risks associated with the use of most of the chemicals that are proposed to be used, additional information as outlined below is necessary to ensure risks from some chemicals are minimised.

Hydraulic fracturing

20. It is stated that between 30 and 60 wells may be hydraulically fractured (PD, p. 21) and that horizontal wells may be used (PD, p. 19). The use of hydraulic fracturing and horizontal wells introduces complex risks to groundwater and these have not been identified in the proponent's risk assessments. The proponent needs to assess the potential risks of horizontal wells on hydraulic fracture propagation on adjacent hydrogeological units, chemical transport within the coal seam and whether any additional flowback water management is required. The proponent should identify the location, length and direction of horizontal wells and any that are likely to require hydraulic fracturing.
21. While the IESC considers there is limited risk of connectivity to the surface, the proponent states that hydraulic fracturing could produce a horizontal fracture network up to 375 m from the well for vertically drilled wells (PD, App. 12, p. 68). Predictions of fracture propagation distances for horizontal wells have not been provided. Given the above, and to support the assessment needs identified in paragraph 22, the proponent should provide predictions of the possible vertical extent of changes in hydrogeological properties (e.g. the density and aperture of vertical fractures) in strata adjacent to the hydraulically fractured Walloon Coal Measures. This should include changes from both vertical and horizontal wells.
22. The Springbok Sandstone is known to be heterogeneous, consisting of interfingering aquifers and aquitards (QGC 2012, p. 4). It immediately overlies the Walloon Coal Measures (PD, App. 12). It may, therefore, be affected by hydraulic fracturing in the coal measures. The proponent details in their risk assessment how they will take steps to avoid hydraulic fracturing from affecting groundwater users' bores (PD, App. 12, p. E22). The IESC considers that the risk assessment should also include design measures to ensure that the matrix of the Springbok Sandstone is not impacted by hydraulic fracturing in areas where it behaves as an aquifer.
23. Given that additive hazards identified for the chemical mixtures were very high (Hazard Indices $\gg 1$), assessing the toxicity of the produced water is essential. The proponent has undertaken a Direct Toxicity Assessment (DTA) of the background source water, some hydraulic fracturing fluids and flowback waters, and a brief summary was provided (PD, App. 12, p. 146). However, the IESC is unable to assess the adequacy of the full DTA or the proposed treatments to reduce the exposure risks, as neither the full DTA report nor the underlying chemistry and ecotoxicity data were provided.
24. Providing the full hydraulic fracturing chemical DTA is particularly important given it is proposed to use a number of cross-linked fluids in the hydraulic fracturing fluid (PD, App.12, p. 74). Some of these fluids potentially have high ecotoxicities and will increase the risks associated with flowback water management taking place at the surface. Providing chemical concentrations within and the

proportion of recovered hydraulic fracturing fluids from flowback waters at existing operations would support the assessment of activities to reduce risks at the surface.

Drilling chemicals

25. The proponent's chemical assessment (PD, App. 5) should address the following issues.
- a. Some chemicals which have limited or no information are assessed as 'low toxicity' or are stated, without evidence, to be not persistent, bioaccumulative or toxic.
 - b. The risk assessment does not consider mixture toxicities and does not provide a DTA for the suite of chemicals assessed.
 - c. An assessment of the salt content of drilling muds and potential contingencies is needed to manage risks if a surface spill occurred.

Landspray while drilling

26. The LWD procedure is conditioned in the proponent's existing EA for the Condabri development (PD, App. 2 conditions G21 to G25). While monitoring of metals, total petroleum hydrocarbons and electrical conductivity is proposed, other organic contaminants in drilling muds may also leach into soils, surface water and groundwater. These other contaminants should also be monitored in the water table aquifer and their environmental fate and risks assessed over the life of the project.
27. The IESC considers that, in addition to the existing conditions:
- a. LWD should not occur in or near native vegetation; and,
 - b. LWD should not occur on the same area unless at least six months have passed since the last application, or until contaminant levels have returned to background levels.

Question 5: Can the Committee discuss the measures specified within the document to monitor, mitigate and manage impacts to water resources, and indicate other measures that may be required?

Groundwater monitoring

28. The groundwater monitoring plan (PD, App. 11) does not include monitoring points in aquifers west of the proposed project area. Given the project area is located on the far south-western edge of a large CSG development area, monitoring in this location will be important to identify the potential propagation of groundwater impacts through a reference bore in a west to south-westerly direction.
29. The proponent should install at least one nested-bore monitoring site, screened in multiple aquifers (within, above and below the Walloon Coal Measures), on the western side of the Leichhardt-Burunga Fault to inform an understanding of the fault's influence on groundwater flows. This site could then be compared to data gathered from a nested site on the eastern side of the fault. Ideally, an additional two nested-bore monitoring sites should also be located along strike of the fault, on its east and west side, to identify any groundwater influence parallel to the fault plane.
30. Groundwater quality monitoring data, as required through the proponent's EA, should be provided to support the assessment (see paragraph 7). If the proposed project were approved, the groundwater quality monitoring required in paragraph 7 should be maintained throughout the life of the project.

31. As described in paragraph 6, groundwater monitoring should include monitoring of hydraulic head within the Walloon Coal Measures and the hydrogeological sequence that overlies it.

Monitoring of hydraulic fracturing

32. The proponent's EA sets out the monitoring requirements for hydraulic fracturing activities (PD, App. 2, conditions I14 – I23). As noted in paragraph 2 the proponent should have considerable data from existing operations including fracture extent from hydraulic fracturing. The proponent should provide monitoring data from hydraulic fracturing activities undertaken within these existing adjacent CSG developments. This data should then be used to verify the chemical transport modelling results and support statements on the fracture propagation distances within key hydrogeological units. Ideally, this information could be presented to increase confidence that fractures do not propagate to beneficial aquifers, and be should be updated with additional data from each new hydraulic fracturing procedure.

Surface water monitoring and management

33. The proponent's existing EA for the Condabri CSG development area incorporates a range of surface water monitoring and management measures. Much of the data provided in the draft PD is prior to 2014. The proponent's assessment should be supported by more recent data collected as a requirement of the conditions of that EA.
34. Project-specific water quality objectives are presented in the Talinga and Condabri Central Receiving Environment Monitoring Program: Condamine River (PD, App. E of App. 8, Table 4.1). Some of the project-specific water quality objectives are less protective than the corresponding ANZECC/ARMCANZ guidelines. For example, the release contaminant limits set in the proponent's EA (PD, App. 2, Schedule B, Table 3) for copper and zinc are 2 mg/L and 3 mg/L respectively. These concentrations are approximately three orders of magnitude less protective than the ANZECC/ARMCANZ guideline values. The proponent states 'where there are multiple [water quality objectives] for a particular indicator to protect different environmental values, the most stringent [water quality objective] applies' (PD, App. 8, p. 14). The proponent should clarify which water quality objectives apply for the proposed project. Where a project-specific water quality objective is less protective than the ANZECC/ ARMCANZ guidelines (e.g. boron), justification for the use of less protective water quality objective needs to be provided.
35. As described in paragraph 14, the residual risk of brine pools can be managed with the use of monitoring and a TARP.

Groundwater dependent ecosystem monitoring and management

36. Potential impacts to GDEs are managed under a Groundwater Monitoring Plan (Q-LNG-0110-MP-0005, App. 11) developed in 2014. A recently updated plan (CDN/ID 11788517) was not available for the IESC but has been submitted to the Department of the Environment and Energy for approval before superseding the current plan (PD, p. 82). The proponent states that the current Plan is consistent with the Joint Industry Plan (JIP) for an Early Warning System for the Monitoring and Protection of EPBC Springs (PD, App. 11, p. 7), which was developed by collaboration among the major CSG proponents because their activities are likely to cumulatively impact upon EPBC-listed springs.
37. The proponent identifies two spring complexes near the project area: Wambo Creek Springs some 30 km east and Orana some 42 km north-east. Both obtain groundwater from Cainozoic sediments. Hydrogeological connectivity between the Cainozoic sediments and the Walloon Coal Measures is considered unlikely due to the thickness of intervening aquifers and aquitards, and the proponent considers there is a negligible potential for impact from CSG drawdown (PD, p. 64). The IESC suggest that both these springs, as well as any others revealed by the approaches

suggested in paragraph 11, should be monitored using methods described in the JIP to confirm the proponent's conclusion that there is negligible effect. Management or recovery plans for the GDEs should be proposed if drawdown is possible.

38. For GDEs other than springs and that are identified in the project area using the approaches recommended in the responses to Questions 1 and 2, the proponent should undertake local monitoring within the potential zone of impact to determine water table depths and their seasonal variability in proximity to GDEs, such as remnant patches of terrestrial groundwater-dependent vegetation, pools along Jacky Jacky Creek and an unnamed wetland within a 15-km radius of the project area (indicated on the GDE Atlas as having a 'medium' potential to be GDEs (Commonwealth of Australia, 2017)). Monitoring groundwater quality is also important, especially for Type 1 GDEs (e.g. aquifers and their stygofauna) that rely on permanent inundation with groundwater.

Date of advice	18 November 2017
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Source documentation available to the IESC in the formulation of this advice	<p>Draft Preliminary Documentation 2017. Alfredson Development – Preliminary Documentation. Australia Pacific LNG, September 2017.</p> <p>Referral 2017. Referral of proposed action - Alfredson Block CSG Project. Australia Pacific LNG on behalf of Origin. March 2017.</p> <p>Geoscience Australia 2017. Letter - RE: Alfredson Block CSG Project, Qld – EPBC 2017/7902. Department of Industry, Innovation and Science, comment on Referral. 28 March 2017.</p> <p>IESC 2015. <i>Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals</i>. Available [online]: http://www.iesc.environment.gov.au/system/files/resources/012fa918-ee79-4131-9c8d-02c9b2de65cf/files/iesc-information-guidelines-oct-2015.pdf.</p>
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