AARV2018-000176

Government of South Australia
Department of State Development

1 March 2018

Mr Jarrod Spencer
Senior Environmental Officer, Regulation and Assessment
Energy and Resources Division
Department of the Premier and Cabinet
GPO Box 323
Adelaide SA 5001

Email: Jarrod.Spencer2@sa.gov.au

Dear Mr Spencer

RE: Request for Comments - Leigh Creek Energy - In-Situ Gasification Demonstration Plant EIR and Draft SEO

I refer to your email dated 12 January 2018 to the Department of State Development, Aboriginal Affairs and Reconciliation (DSD-AAR) seeking agency comment on an Environmental Impact Report, Draft Statement of Environmental Objectives and Environmental Significance Assessment for Leigh Creek Energy's (LCK) In-Situ Gasification (ISG) Demonstration Plant.

LCK states it has developed, in consultation with the traditional owners, a series of cultural heritage discovery protocols as well as a cultural heritage agreement for the project. In addition to these frameworks, it may be prudent for LCK to develop an overarching Cultural Heritage Management Plan (CHMP) for the project (if this is not already included in the cultural heritage agreement). A CHMP would augment LCK's existing heritage management frameworks by laying out measures to be undertaken before, during and after project activities to adequately manage the protection of Aboriginal heritage.

The Aboriginal Heritage Act 1988

The *Aboriginal Heritage Act 1988* (AHA) applies to the entirety of the Leigh Creek Mine Site (PEL 650 inclusive) and provides for the protection of all Aboriginal sites, objects and remains, including recorded, reported or undiscovered heritage. This protection extends to Aboriginal sites, objects and remains which may exist in areas which have been disturbed in the past and/or subject to a cultural heritage survey or work area clearance.

Section 20 of the AHA provides that if Aboriginal sites, objects or remains are discovered, LCK is required to report the discovery to the Minister for Aboriginal Affairs and Reconciliation (the Minister) through DSD-AAR as soon as practicable. Discoveries can be reported to DSD-AAR on (08) 8226 8900 or via email at dsdaarheritagesites1@sa.gov.au.

In the event that Aboriginal sites, objects or remains are discovered, the site area should be avoided. Prior authorisation from the Minister is required to damage, disturb or interfere with the Aborignla sites, objects and remains pursuant to section 23 of the AHA.

The Central Archive and the Register of Aboriginal Sites and Objects

DSD-AAR administers the Central Archive on behalf of the Minister. The Central Archive, which contains the Register of Aboriginal Sites and Objects, currently holds records for one registered Aboriginal site, one report Aboriginal site and one reported Aboriginal object within PEL 650 (Attachment 1). There are no Aboriginal sites, objects and remains recorded at, or in the immediate vicinity of, the ISG Demonstration Plant. The closest Aboriginal site or object included on the Central Archive is located approximately 1 kilometre to the west.

Please note that the records held in the Central Archive are not comprehensive, and as such Aboriginal sites, objects and remains may nevertheless exist within PEL 650. The Central Archive is regularly updated with new site records. Therefore, requests for searches of the Central Archive are recommended prior to any planned ground disturbing activities commencing. Requests for a search of the Central Archive can be sent to dsdaarheritagesites1@sa.gov.au.

Aboriginal Sites, Objects and Remains

DSD-AAR notes that LCK has engaged Adnyamathanha Traditional Lands Association (ATLA) members to undertake work area clearances in relation to the ISG Demonstration Plant. Despite the fact that the area has been heavily disturbed through previous ground disturbing works, LCK should be aware that ground disturbing activities may still pose a risk to Aboriginal sites, objects and remains which exist below the ground.

Further, where ground disturbing works occur in areas which have not been cleared as part of a work area clearance, the risk of discovery is increased. LCK should refer to Attachment 2 and Attachment 3 for further advice on how it can manage its obligations under the AHA.

Environmental Impact Report – DSD-AAR Comments:

DSD-AAR has reviewed the document and recommends the following adjustments:

A. Page 9

- *Delete "~~A Cultural Heritage Discovery Procedure is in place to ensure that Aboriginal and non-Aboriginal heritage sites and or items are protected if they are discovered during site activities~~" and replace with: A Cultural Heritage Discovery Procedure is in place to ensure that Aboriginal sites, objects and remains, as well as non-Aboriginal heritage sites and or items, are protected if they are discovered during site activities.*

B. Page 54 (Section 4.2.1. – Aboriginal Cultural Heritage)

- *The following paragraph should be added at the top of this section: The AHA applies to the entirety of the Leigh Creek Mine Site (PEL 650 inclusive) and provides for the protection of all Aboriginal sites, objects and remains, including recorded, reported or undiscovered heritage. This protection extends to Aboriginal sites, objects and remains which may exist in areas which have been disturbed in the past and/or subject to a cultural heritage survey or work area clearance.*

C. Page 54 (Section 4.2.1. – Aboriginal Cultural Heritage)

- *Delete "~~A search of the Register of Aboriginal Heritage Sites and Objects (DSD-AAR 2016) indicated that there are 22 registered or reported sites within 10 km of PEL 650~~" and replace with: A search of the Central Archive, which contains the Register of Aboriginal Sites and Objects (DSD-AAR 2016), indicated that there are 22 registered or reported sites within 10 km of PEL 650.*

D. Page 54 (Section 4.2.1. – Aboriginal Cultural Heritage)

- Note: DSD-AAR updates the Central Archive regularly. As such, it is recommended that proponents submit periodic search requests to dsdaarheritagesites1@sa.gov.au. Requesting a search of the Central Archive is especially prudent prior to commencing any ground disturbing activities.

E. Page 54 (Section 4.2.1. – Aboriginal Cultural Heritage)

- *Delete "~~There are no Aboriginal cultural heritage sites recorded at or in the immediate vicinity of the demonstration plant site~~" and replace with: There are no Aboriginal cultural heritage sites registered at or in the immediate vicinity of the demonstration plant site. However, undiscovered Aboriginal sites may still be present in areas which have previously been disturbed.*

Draft Statement of Environmental Objectives – DSD-AAR Comments:

DSD-AAR has reviewed the document and recommends the following adjustments:

A. Page 8 (Table 1: Environmental Objectives and Assessment Criteria – Guide to How Objectives Can be Achieved)

- Insert the following as the final point in the third column: *If Aboriginal sites, objects and remains are discovered, the discovery is reported to the Department of State Development, Aboriginal Affairs and Reconciliation on (08) 8226 8900 or via email at* dsdaarheritagesites1@sa.gov.au.

Environmental Significance Assessment – DSD-AAR Comments:

A. Page 5 (Section 5.1 – Cultural and Heritage Impacts)

- Ensure that the word 'journey' is spelled correctly.

Aboriginal Engagement

Below are the contact details for the Aboriginal groups relevant to the Leigh Creek area:

ADNYAMATHANHA TRADITIONAL LANDS ASSOCIATION

Chairperson	Damian Coulthard
Mobile:	0466 399 789
Email:	Damian.coulthard@sa.gov.au chairperson@ATLA.com.au
Lawyer:	Richard Bradshaw and Graham Harbord
Postal Address	Johnston Withers 17 Sturt Street ADELAIDE 5000
Email:	richard.bradshaw@johnstonwithers.com.au graham.harbord@johnstonwithers.com.au

ADNYAMATHANHA YURA LANGUAGE AND HERITAGE ASSOCIATION INC.

This Association has also expressed an interest in the Leigh Creek Area and they can be contacted through their legal representative Mr Tim Campbell at:

Campbell Law

Postal Address:	Suite 7, Level 1, 118 Halifax Street, Adelaide, SA 5000
Phone:	(08) 8227 1223
Mobile:	0438 639 552
Email:	tim@campbelllaw.com.au; www.campbelllaw.com.au

DSD-AAR has developed two Fact Sheets to assist proponents in managing their obligations under the AHA. These Fact Sheets can be found online at https://statedevelopment.sa.gov.au/aboriginal-affairs/aboriginal-affairs-and-reconciliation/aboriginal-heritage/guidance. These Fact Sheets are also attached to this letter (Attachment 2 and Attachment 3).

DSD-AAR is available to provide an Aboriginal heritage legislative awareness session for LCK employees and contractors free of charge.

Should you wish to make further enquiries about the awareness session or any other matters raised in this letter, please do not hesitate to contact me via email at jackie.antoun@sa.gov.au or by phone on (08) 8226 8900.

Yours sincerely

Ms Jackie Antoun
Manager Aboriginal Heritage
Aboriginal Affairs and Reconciliation

Attachments:
Attachment 1: Aboriginal sites in relation to the ISG Demonstration Plant
Attachment 2: Project Planning and Aboriginal Heritage Fact Sheet
Attachment 3: Discovery of Aboriginal Sites and Objects Fact Sheet

ABORIGINAL HERITAGE SITES

Government of South Australia
Department of State Development

Legend

- Locality

AAR Heritage Sites

- Registered
- Reported
- Demonstration Plant
- PEL 650

Roads

- Highway
- Principle Road
- Secondary Road
- Minor Road

N

1:90,000

0 1 2 3 4

Kilometres

PEL 650

Produced by: Heritage Information Team, Department of State Development, Aboriginal Affairs and Reconciliation (DSD-AAR)

Data Source: Roads / Topographic / ParcelID - LocSA; Heritage Sites - AAR

Projection: Lambert Conformal Conic
Datum: Geocentric Datum of Australia 1994
Job No: 201803O
Compiled: 30/01/2018

Project Planning and Aboriginal Heritage

The *Aboriginal Heritage Act 1988* (the Act) protects all Aboriginal sites, objects and ancestral remains throughout South Australia. Project planning that involves traditional owners and which carefully considers potential impacts on Aboriginal heritage can mitigate the risk of impact on Aboriginal heritage during project works.

When projects are planned to take place in areas where known Aboriginal heritage exists, there is a risk project activities may damage, disturb or interfere with the known Aboriginal sites, objects or remains. In project areas where heritage is unknown or may be subsurface, there is also a risk of damage to Aboriginal heritage uncovered or discovered during project works. There are penalties under the *Aboriginal Heritage Act 1988* for unauthorised impact on Aboriginal heritage. The risk of impacting heritage may be mitigated by a planning process that includes consultation with Aboriginal parties to identify and assess heritage and which inform controls that manage the potential for impact on heritage during the project works.

Identification of Aboriginal Heritage

Prior to commencing ground disturbing works, a proponent should gather as much information as possible about the known Aboriginal heritage and potential for discovery of Aboriginal heritage in the project area. Ways of collecting heritage information include:

- Requesting a search of the Register of Aboriginal Sites and Objects and the Central Archive maintained by the Minister for Aboriginal Affairs and Reconciliation
- Talking to the relevant Recognised Aboriginal Representative Body (RARB), or where there is no RARB appointed in the project area, the local Aboriginal heritage organisations, or the Native Title body, in conjunction with a suitably qualified archaeologist and/or anthropologist about the risk of damage to heritage in the project area. (Search the Register of RARBs for the contact details of the relevant RARB)

Register of Aboriginal Sites and Objects and the Central Archive

The Central Archive, which includes the Register of Aboriginal Sites and Objects, is maintained by the Minister for Aboriginal Affairs and Reconciliation and contains information about Aboriginal sites, objects and ancestral remains (burials) across South Australia.

Enquiries about the presence of Aboriginal sites in a specified area are made by requesting a search of the Register. The response will be a letter indicating whether sites have been recorded in the area and if relevant, a basic map showing the approximate location of sites. For more detailed information, including map coordinates, permission from the traditional owners of the site is required.

Visit the Department of State Development, Aboriginal Affairs and Reconciliation Heritage (DSD-AAR) website to lodge a request for a search of the Register.

The central archive is not an exhaustive record of Aboriginal heritage. The local RARB or other Aboriginal representatives may have additional information. Search requests should always be complemented with consultation with the relevant local RARB, or where there is no appointed RARB, with recognised representatives of the relevant Aboriginal communities of the project area.

Recognised Aboriginal Representative Bodies

A RARB is organisation that represents the views and knowledge of traditional owners of an area, site or object. A RARB can enter a Local Heritage Agreement (under the Act) with proponents to manage the effects of project works on Aboriginal heritage.

A RARB may negotiate a Local Heritage Agreement with a proponent when either an application for authorisation to damage, disturb or interfere (section 23) with Aboriginal heritage, or an application to excavate for uncovering of an Aboriginal site, object or remains (section 21) is made under the Act. A Local Heritage Agreement with a RARB can specify conditions under which Aboriginal heritage in a project area is managed in culturally appropriate ways. Before entering into a Local Heritage Agreement, a RARB may need to consult a particular family group or individual who holds traditional knowledge about Aboriginal sites in the project area.

RARBs are appointed under the Act. All RARB appointments and contact details are listed on the Register of RARBs available from the DSD-AAR website.

Other Aboriginal Organisations

In areas where there is no appointed RARB, the proponent may consult with the relevant Aboriginal heritage or native title organisation or committee to discuss Aboriginal heritage in the project area. Any discussions or agreements with these groups can form part of a proponent's strategy for managing the risk of impact on Aboriginal heritage.

ASSESSMENT

Aboriginal Cultural Heritage Surveys

Professional archaeologists and anthropologists, in consultation with relevant Aboriginal parties, are qualified to undertake surface heritage surveys which can identify Aboriginal sites of significance according to Aboriginal tradition, or to Aboriginal archaeology, anthropology or history. It is recommended consultant archaeologists/anthropologists engagement briefs include details of:

- engagement with the relevant RARB, or where there is no RARB appointed, the Aboriginal parties who have a traditional connection with the area and who are authorised by the relevant Aboriginal community to provide information about heritage in the area.
- arrangements for statutory reporting of any newly identified sites, objects or remains to the Minister for Aboriginal Affairs and Reconciliation in accordance with section 20 of the Act including arrangements for lodging reports and site cards with DSD-AAR.
- identification of 'go' and 'no go' zones within the project area from the perspective of protection of Aboriginal heritage. The significance of the areas to be avoided should be clearly explained.
- identification of mitigation, risk management and protective measures to secure or protect Aboriginal heritage.
- articulation of the steps to be taken on discovery of Aboriginal heritage
- assessment of the risk if development, exploration or mining activity occurs without seeking a section 23 authorisation under the Act.
- acknowledgement that only the Minister can authorise damage, disturbance or interference to Aboriginal sites, and objects or remains and a proponent cannot avoid seeking an authorisation solely through agreement making with a RARB or Aboriginal people.

CONTROLS

Cultural Heritage Management Plans

In consultation with the RARB, or if there is no appointed RARB, the relevant Aboriginal representative parties, the proponent may wish to develop a cultural heritage management plan (CHMP) to specify the culturally appropriate protection and management of Aboriginal heritage in the project area. A CHMP is normally drafted as an outcome of a heritage assessment or survey and should detail the nature, extent and significance of any Aboriginal cultural heritage sites identified in the project area and specify recommendations or measures to be taken before, during and after project activities to manage the protection of the heritage.

Local Heritage Agreements

A local heritage agreement is an agreement under the Act between a land use proponent and a RARB that deals with the impact of the proponent's activities on any Aboriginal heritage in the area covered by the agreement.

A local heritage agreement is submitted to the Minister for Aboriginal Affairs and Reconciliation who may, if satisfied that the agreement satisfactorily deals with any heritage that may be in the relevant area, approve the agreement. Once approved, the Minister must grant an authorisation to the proponent to excavate the land or to damage, disturb or interfere with any sites, objects or the remains on the condition that the proponent complies with the agreement. For more information about Local Heritage Agreements, see the *Aboriginal Heritage Guideline 3 Local Heritage Agreements.*

Agreements under Native Title and other Acts

Agreements that deal with Aboriginal heritage but have been made under other legislation can be approved by the Minister for Aboriginal Affairs and Reconciliation (the Minister) under the *Aboriginal Heritage Act 1988* providing they sufficiently deal with the impact of a land use proponent's (e.g. a miner, developer or government agency) activities on Aboriginal heritage in the area covered by the agreement. Agreements made under other legislation that can be recognised under the Act are:

1) an indigenous land use agreement under the *Native Title Act 1993* of the Commonwealth (NTA);
2) an agreement under Part 2 Division 3 Subdivision P of the NTA;
3) a native title mining agreement under the *Mining Act 1971* or the *Opal Mining Act 1995*; and
4) an agreement under the *Land Acquisition Act 1969* relating to native title rights and made in relation to a prescribed private acquisition (within the meaning of that Act).

Agreements under these Acts can be lodged for approval under the Aboriginal Heritage Act 1988. For further information see *Aboriginal Heritage Guideline 2 Division A2 Agreements*

Authorisations and Agreements

An approved local heritage agreement by itself does not allow proponents to impact heritage as described in the agreement. This requires additional authorisation from the Minister. Applications can be made through the DSD-AAR website. Although this is an additional step, if an approved local heritage agreement is submitted with a request for authorisation, the Minister must grant authorisation for the activities described in the agreement.

A proponent may request an authorisation to impact heritage without a local heritage agreement, in which case the request will be processed in accordance with the consultation provisions in the Act and the Minister will decide whether to grant the authorisation.

Monitoring

Where an Aboriginal heritage survey has identified areas of potential archaeological significance and/or subsurface burials, a risk management option to consider is employing suitably qualified archaeologists and Aboriginal monitors to undertake specified tasks in relation to ground disturbing works in those areas. The terms of Aboriginal monitoring may be defined in a local heritage agreement with the relevant RARB, or where there is no appointed RARB, a CHMP or a formal agreement between the proponent and the relevant Aboriginal heritage organisation or native title body.

Discovery plan

Where there is a high risk of a subsurface discovery, it is recommended that prior to ground disturbing works, proponents work with the relevant RARB, or where there is no appointed RARB, the relevant local Aboriginal organisation, and plan for the event of a discovery. A discovery plan must be included in a local heritage agreement, and may be included in a CHMP or any other agreement. A discovery plan developed in consultation with the Aboriginal party and may specify:

- The Aboriginal contact person/s for any discoveries.
- A preferred archaeologist/anthropologist to be called in the event of a discovery.
- A preferred approach for the preservation in situ of any Aboriginal sites or objects discovered.
- A preferred approach to the preservation in situ or recovery of any ancestral remains discovered.
- A secure location for the storage of any recovered ancestral remains prior to a reburial.
- Arrangements for the reporting of the discovery to the Minister, in compliance with section 20 of the Act.

A discovery plan does not authorise impact on Aboriginal heritage; authorisation from the Minister under section 23 of the Act is required for any damage, disturbance or interference with Aboriginal sites, objects or remains.

Discovery of Ancestral Remains

The *Discovery Protocol for Ancestral Remains* has been developed in consultation with the State Aboriginal Heritage Committee and should be implemented immediately whenever skeletal remains are discovered. The Protocol is based on proponents' responsibilities under the *Coroner's Act 2003* and Aboriginal peoples' rights under the *Aboriginal Heritage Act 1988.*

In summary, in the event of discovery of bones which may be human, all works in the discovery area should immediately stop and the discovery must be reported to the South Australian Police (SAPOL). If SAPOL confirms the discovery as Aboriginal ancestral remains, the proponent and RARB, or where there is no appointed RARB the relevant local Aboriginal parties, may reach agreement to manage the discovery; including recovery, reburial and any associated cultural ceremony.

Legislative Awareness Workshops

DSD-AAR provides Aboriginal Heritage legislative awareness workshops designed to assist proponents and their contractors understand obligations under the Act. For more information or to request a workshop, visit the DSD-AAR website and submit a *Request a Workshop* form.

Contact

Department of State Development
Aboriginal Affairs and Reconciliation
Level 7, 11 Waymouth Street, Adelaide, South Australia 5000
GPO Box 320, Adelaide, South Australia 5001
T: +61 8 8226 8900
E: DSD.AARHeritage@sa.gov.au
Website: www.statedevelopment.sa.gov.au/AHA

SOUTH AUSTRALIA

Government of South Australia
Department of State Development

Discovery of Aboriginal Sites and Objects

An owner or occupier of private land, or an employee or agent of such an owner or occupier, who discovers an Aboriginal site or object on that land, must report the discovery to the Minister for Aboriginal Affairs and Reconciliation. If human remains are discovered, stop works immediately, contact the SA Police and see Discovery of Aboriginal Ancestral Remains.

Potential Aboriginal sites

Any land, developed or undeveloped, may contain Aboriginal sites and/or objects of significance to Aboriginal archaeology, anthropology, tradition and history. These sites and objects may relate to Aboriginal spiritual beliefs and ceremonial activities, living patterns and burials and the use of environmental resources such as water, animals, plants and stone. Sites may be obvious or subtle features in the landscape or may be completely hidden beneath the ground's surface. Some sites may have very little material evidence left but remain known in the oral histories of Aboriginal people.

Certain landscape features are more likely to be Aboriginal sites and/or contain evidence of Aboriginal occupation. These certain landscape features therefore pose a higher risk for the discovery of Aboriginal sites and objects. Unusual landscape features, for example, distinctive hills, rocky outcrops, rock holes or trees, often have cultural significance. Examples of some landscape features and the types of Aboriginal sites that they are often associated with are:

- Clay pans, lakes, rivers and estuaries may contain stone artefact scatters, shell middens, rock art, campsites and stone arrangements. These landscape features may also be considered cultural sites by Aboriginal people.
- Rocky outcrops may contain quarries, rock art, rock holes, stone arrangements, ceremonial sites and stone artefact scatters. These landscape features may also be considered cultural sites by Aboriginal people.
- Dunes and sand hills may include stone artefact scatters, campsites and burials. These landscape features may also be considered cultural sites by Aboriginal people.
- Craters and sink holes are often cultural sites.
- Areas in close proximity to the coast may include campsites, stone artefact scatters, shell middens and burials.
- Areas within close proximity to creeks, rivers, watercourses, lakes, waterholes, rock holes, wells and springs, whether permanent, seasonal or ephemeral, may also contain campsites, stone artefact scatters, burials and other signs of Aboriginal occupation, especially in arid zones.
- Areas which have been less developed, such as parks, open land or road verges, may still contain artefact scatters or subsurface archaeological material such as burials and earth ovens.
- Places bearing Aboriginal names, or place names which are English translations of Aboriginal names or indications of Aboriginal interaction with the landscape (including words such as 'Black' or 'Spear') may indicate previous Aboriginal connection to that location and may have significance to Aboriginal people.

Damaging, disturbing or interfering with Aboriginal sites and objects without the authorisation of the Minister for Aboriginal Affairs and Reconciliation is an offence under the *Aboriginal Heritage Act* 1988 (the Act). Disturbing Aboriginal sites may also cause distress and offence to Aboriginal people. In addition, the cultural and archaeological value of a site may be diminished if it is damaged, disturbed or interfered with.

Contact

Department of State Development
Aboriginal Affairs and Reconciliation
Level 7, 11 Waymouth Street, Adelaide, South Australia 5000
GPO Box 320, Adelaide, South Australia 5001
T: +61 8 8226 8900
E: dsd.AARHeritage@sa.gov.au
www.statedevelopment.sa.gov.au/aboriginalheritage

SOUTH AUSTRALIA
Government of South Australia
Department of State Development

Discovery plan

In areas where there is a high risk that ground disturbing works may encounter subsurface Aboriginal sites or objects, proponents can work with the local Aboriginal organisation to develop a discovery plan before works commence. A discovery plan may specify:

- Aboriginal contact persons for any discoveries of Aboriginal sites or objects;
- A preferred archaeologist/anthropologist to be contacted in the event of a discovery;
- a preferred approach for the in-situ preservation of any Aboriginal sites or objects discovered; and
- arrangements for reporting a discovery to the Minister.

A discovery plan may form part of a cultural heritage management plan or an agreement between the proponent and the local Aboriginal organisation(s). A discovery plan cannot provide authorisation for the damage, disturbance or interference with an Aboriginal site or object. Authorisation from the Minister is required if sites are to be excavated or interfered with or objects removed.

Reporting the discovery of an Aboriginal site or object

If an Aboriginal site or object is discovered during ground disturbing works, the proponent should ensure that works cease immediately in the vicinity of the discovery. Care should be taken not to further disturb or damage the site or object.

Notification of the discovery of the site or object (and remains) is required pursuant section 20 of the Act, and can be made to the Minister through the Aboriginal Heritage Team at the Department of State Development, Aboriginal Affairs and Reconciliation (DSD-AAR).

When reporting the discovery of a site or object, the following information should be provided:

- Location of the site or object – preferably through the use of a GPS in northings and eastings, or indicated on a map
- Description of the site or object
- Approximate dimensions of the site
- Description of how to get to the site
- Your name and contact details
- Name and contact details of the person who discovered the site
- The circumstances surrounding the discovery
- Photographs of the site or object

Managing a discovery area

Once work has stopped and the discovery reported, the proponent should consider whether continuing the works will result in damage or disturbance to, or interference with the Aboriginal site or object.

If an authorisation under section 23 has been already been granted in relation to the project area, the proponent should comply with any conditions related to discovery that the Minister has set as part of that authorisation.

If an authorisation is not in place and the discovered site cannot be avoided, the proponent will require an authorisation from the Minister under section 23 of the Act before continuing with the works. See How to Apply under Section 23 of the Act and the Section 23 Application Form.

When a site is first discovered, its extent is often unknown. Inadvertently exposing an object or part of a site may only uncover a small portion of what may be a much larger Aboriginal site. If further excavation is planned to uncover the full extent of the Aboriginal site or any objects, an authorisation from the Minister under section 21 of the Act is required. See Permission to Excavate under Section 21 of the Act and the Section 21-23-29 Application Form.
Sites can be recorded using DSD-AAR site card templates. For more information about recording sites, see Recording Archaeological Sites, Recording Cultural Sites and Recording Song Lines.

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

EPA 05/13746

Mr Jarrod Spencer
Senior Environmental Officer,
Energy Resources Division
Department of the Premier and Cabinet
Level 6, 101 Grenfell Street
ADELAIDE SA 5000

Dear Jarrod

Thank you for the opportunity to provide comment on the following documents:

- Leigh Creek Energy, Environmental Impact Report, ISG Demonstration Plant (dated 20 December 2017); and
- Leigh Creek Energy, Draft Statement of Environmental Objectives, ISG Demonstration Plant (dated 20 December 2017).

The EPA acknowledges that the Department of the Premier and Cabinet is the lead regulator for the Leigh Creek Energy (LCK) In Situ Gasification (ISG) project and any approval of the project will occur under the *Petroleum and Geothermal Energy Act 2000* (P&GE Act) administered by Energy Resources Division of the Department of the Premier and Cabinet (ERD-DPC).

As you are aware, the EPA has been involved in the assessment process through the LCK internal government reference group which first met with LCK in January 2016. Since this time, the EPA has participated in a number of meetings with LCK to enable discussion around their vision and intentions for the project and anticipated timelines.

Through the assessment process of the Environmental Impact Report (EIR) and Draft Statement of Environmental Objectives (SEO), advice has been sought from the EPA Air Quality, Water Quality and Site Contamination branches.

The EPA has also assessed the EIR and SEO to determine if any specific authorisations are required under the *Environment Protection Act 1993* (EP Act), including Schedule 1 'Prescribed Activities of Environmental Significance'. The demonstration plant trial, if approved by ERD-DPC, will not attract an authorisation under the EP Act.

The EPA recognizes its limited regulatory experience with In Situ Gasification projects and has therefore limited its response to the key areas of site contamination, air and water quality. The EPA commends ERD-DPC for engaging the services of an independent geotechnical expert who has completed an evaluation of the relevant stress mechanics in deep wells drilled by LCK to further inform on fracture pathway critical uncertainties.

The EPA also acknowledges that ERD-DPC have incorporated their learnings from consultation with the Lawrence Livermore National Laboratories who were used as independent advisors as part of their assessment.

Draft Environmental Impact Report (EIR)

Air Quality Assessment

The modelling appears to have been undertaken accordingly, with a conservative approach. However, there are several issues the EPA requests clarification:

- The modelling's meteorological input was based on data from the Leigh Creek Airport. There does not appear to be any information regarding the validity of this data. Over what period of time was this data taken? What parameters were monitored? What were the averaging periods? How does it compare to the meteorology from 2009, a 'typical' meteorology year requested by the EPA for consistency?

- Page D-2: states that modelling of emissions from the thermal oxidiser is for NO_2, CO, SO_3, H_2S and particulates. The thermal oxidiser is meant to oxidise flue gas pollutants, and it appears that for sulphur trioxide to exist suggests oxidation must be effective, yet CO and H_2S suggests otherwise since their existence indicates ineffective oxidation. Furthermore, given SO_3 tends to be a mist, we would have expected SO_2 to also be modelled.

- Despite health related ground level concentrations expected to be well below the standards in Schedule 2 of the Environment Protection (Air Quality) Policy 2016

(the “Air EPP”), the potential for exceedance of the H_2S odour criterion at Copley due to purge venting (low or high flow) is a concern, particularly given the separation of Copley from the demonstration plant being 8.5km. Page D-8 describes a ‘sensitivity analysis’ and predictions of 10% for exceedance of the odour Ground Level Concentrations for H_2S. The EPA requests a greater level of explanation as to how this assessment has resulted in this prediction. The EPA suggests it is in the proponent’s interest to determine an estimate for the residents in Copley, of what would be a realistic period and frequency when they will most likely experience a detectable H_2S odour.

Site Contamination Assessment

(in relation to potential groundwater contamination issues)

Table 5-4 *Environmental Risk Assessment for ISG demonstration plant in PEL 650* has identified the following situations:

- loss of well integrity may potentially result in loss of contaminant resulting in the contamination of groundwater, soil and surface water (as well at atmospheric emissions (page 129)
- where gasified pressure exceeds surrounding groundwater pressure causing potential migration of COPC in groundwater away from gasifier and reach surface or near surface environments (page 129)
- where contamination may reach the surface or impacting shallow groundwater or soil vapour via the direct escape of COPC from the gasifier through drill holes or transmissive faults (page 130)
- where contamination may reach the surface or impacting shallow groundwater or soil vapour via gasifier chamber growth intersecting potential vertical and lateral pathways leading to migration of COPC (page 130)
- where contamination may reach the surface or impacting shallow groundwater or soil vapour via increases in permeability of surroundings by mechanical stress changes and fracturing (including significant gasifier chamber collapse) leading to a migration of COPC (page 130)
- where contamination may reach the surface or impacting shallow groundwater via the migration of COPC from gasified chamber after decommissioning /rehabilitation (page 130)

- where contamination may reach the surface or impacting shallow groundwater via leaks or spills of produced fluids at surface, spills or leaks associated with fuel or chemical storage, handling and transport & water supply /use (page 133)

Under each of these circumstances, where there is a loss of contaminants which potentially results in threatening serious or material environmental harm, the EPA should be notified as soon as reasonably practicable (in accordance with section 83 of the Environment Protection Act 1993).

The proponent should also determine that if any impacts results in site contamination of groundwater, environmental harm can be adequately managed (during site operations) to prevent any harm to human health or the environment, or if remediation is required.

Any site contamination of groundwater resultant from the activities at site should be also remediated (if required) in accordance with the guidance in the National Environmental Protection Measure (NEPM) to prevent any harm to human health or the environment as appropriate (for the intended future use of the land).

Groundwater Assessment

The following points attempt to seek clarity/confirmation on groundwater and how it relates to the ISG project proposed. It is understood that a Groundwater Monitoring Plan is currently under development which may address these items.

- Summary, page 9, paragraph 3 (and numerous other sections) – Leigh Creek Energy (LCE) states that there are no aquifers present at or near the demonstration site. This statement is considered to be incorrect, and at best misleading. The studies undertaken by Flinders Power and various predecessors show that there are several aquifers at Leigh Creek coal mine site, including the Telford Gravels aquifer, Aquifers 1 to 4 of the Upper Series Overburden, and the fractured rock aquifer of the weathered basement. LCE must state the presence of otherwise of these specific aquifers at their site.

- Summary, page 10, end of 1st paragraph – States that further groundwater sampling is planned. What groundwater sampling will be undertaken, and when will this work be undertaken?

- Section 3.3.2, dot point 3 – reference is made to the demonstration plant location being more than 100m from potential leakage pathways (old drill holes), however the proposed horizontal and vertical drilling methodology complicates this

statement. Is the above ground infrastructure of the plant site greater than 100m from old drill holes, or is the gasifier and inlet and outlet wells locations greater than 100m from old drill holes? A large number of old drill holes are located at Leigh Creek coal mine – LCE should provide a map showing old drill holes near their above and below ground infrastructure.

- Section 3.3.3, page 28, Table 3-2, row 5, Comment – Should units be m, rather than mm?

- Section 3.3.3, page 29, last paragraph – It would be helpful if LCE included all the Camp and White (2015) site attributes in a table and addressed each of these attributes individually.

- Section 3.10, page 42, Groundwater quality section, paragraph 2 - When will the Groundwater Monitoring Plan (GMP) be developed? The GMP should also include detail on sampling methodology and quality assurance/quality control (QA/QC) procedures.

- Section 3.10, page 42, Groundwater quality section, paragraph 4 – Define how monitoring stability will be determined. Also, define how groundwater quality will be shown to have not been adversely impacted.
    - Section 3.10, page 44, Rationale for Groundwater Monitoring Frequency section, 1st paragraph –The sentinel groundwater monitoring wells are to be placed closer than 50m from the gasifier. What was the rationale for this distance and has consideration been given to the placement of these wells closer to gasifier?

    - Section 3.10, page 44, Rationale for Groundwater Monitoring Frequency section, 1st dot point – Define 'Any sustained increase in pressure…..'

    - Section 3.10, page 45 – LCE need to provide rationale for the distribution of the groundwater monitoring wells.

    - Figure 4-6, page 65 – Are the sites marked contaminated sites on the plan all considered to be contaminated sites, or are they 'areas of environmental concern'?

    - Section 4.6.2, page 71 - Figures 4-10 and 4-11 should state the drill holes used to generate the cross-sections.

- Section 4.6.2, page 73 – where is the location of the geological type section?

- Section 4.6.4, page 76, Siting of the gasifier paragraph – '…at least 100m from faults…' – Is this distance 100m from edge of the fault/fracture zones, or from the centre of the fault/fracture zone?

- Section 4.7.1.3, page 81, Table 4-5 (and Appendix A, page 10, Table 2.1) – This table should state the water quality categories as detailed in the Environment Protection (Water Quality) Policy 2015.

- Section 4.7.3.1, page 83 – It is not clear whether the Telford Gravel aquifer has been encountered in drill holes undertaken at site

- Section 4.7.3.2, page 83 – The assignment of strata to be 'aquitards' need careful consideration and definition. The use of the term 'low permeability' is not specific, and reference should be provided to a 'textbook definition' of aquitards with respect to permeability.

- Section 4.7.3.3, page 84 – 'practically impermeable' is not considered scientific terminology.

- Section 4.7.5, page 89, dot point 1, last sentence – The potential issue regarding fresh water remaining in the groundwater wells after flushing of the well screen can be avoided by utilising the appropriate sampling methodology. If well flushing water remains in the groundwater well, then these wells should have been purged dry several times if possible. The concern over well flushing water suggests that all sampling results may not be representative of actual groundwater conditions.

- Section 4.7.5, page 89, dot point 2 (and page 90 dot point 1) – Petroleum hydrocarbons in the C_{15}-C_{28} range are stated, however in Table 4-6 different petroleum hydrocarbon ranges are provided. It should be stated whether the results are total petroleum hydrocarbons or total recoverable hydrocarbons.

- Section 4.7.5, page 89, last paragraph, last sentence – This statement should be substantiated by the preparation of a results table showing the data obtained compared with the relevant guideline concentrations.

- Table 4.7.5, page 90, Table 4-6 – The table should detail how many samples were analysed; all nutrients, metals and any other analytes not in the table should be listed in the table; were any dioxin groundwater samples taken, and if not, why not? Lab pH has a 6 hour holding time – it should be stated whether the pH data is lab or field pH, and if lab pH is reported, the conformance (or otherwise) with the 6 hour holding time should be detailed. Are metals concentrations total or soluble? From Appendix A, it appears that the reported metals are soluble metals, however ANZECC (2000) comparison concentrations are for total metals, so the reported metals data cannot be directly compared to ANZECC (2000).

- Section 5.2 – There is a large amount of water in pit lakes often present at the Leigh Creek coal mine site. There should be a discussion of this in the groundwater section, as these observations don't seem to agree with the LCE position that there are no aquifers present at site.

- Section 5.2- A groundwater water elevation contour (potentiometric surface) plan should be provided.

- Section 5.2.3, page 113, second paragraph – Explain why the presence of the Main Series and Upper Series pits are expected to keep the 'potential aquifer' dewatered.

- Page 129, Table 5-4, Key Management Measures, Measure number 7 – Are the cement bond logs undertaken over time, or just once (at time of installation)?

- Appendix A, page 3, paragraph 3, last sentence – COPCs are also likely to be absorbed by materials, however it should be noted that desorption can still occur.

- Appendix A, page 3, paragraph 4 – states '…groundwater…not likely to move away from this site in the foreseeable future…', however this report states that groundwater will move away from the site in 2-20 years. 'Foreseeable' should be defined, with inclusion of the timeframe for groundwater migration.
- Appendix A, page 9, Aquitard section – this definition is non-specific. It must define 'low hydraulic conductivity' and 'quantities sufficient for use as a water supply.'

- Appendix A, page 21, Figure 4.2 – What depth does this type geology figure begin from? Are the Telford Gravels present at this site?

- Appendix A, section 4.4, page 22, paragraph 2 – LCE to provide detail of the ‘swabbing technique’, including why this work was undertaken (purpose).

- Appendix A, section 4.8.2 – LCE to provide QA/QC methodologies for the groundwater sampling

- Appendix A, page 33, Table 4.8 – Are hydrocarbons reported as TPH or TRH? There is an error in column 1, below the row ‘ethylbenzene’.

- Appendix A, section 5.1, paragraph 2 – Numerical modelling is referred to, however this has not been provided. Please provide details of this, including why it was omitted from the EIR document.

- Appendix A, section 5.1.2, paragraph 2 -What is the expected radius of influence of the gasifier on surrounding groundwater?

- Appendix A, section 6.1, paragraph 1 – LCE provide discussion regarding beneficial use. Environmental values of groundwater in SA are defined in the Environment Protection (Water Quality) Policy 2015. Based on the salinities of groundwater at site, groundwater has a Livestock Water environmental value.

- Appendix A, Figure 6.1 – LCE to explain how natural attenuation is expected to occur in 200-300 days when highly persistent chemicals (e.g. phenols and PAHs) are expected to be mobilized.

- Appendix A, section 7, page 42, 4.8 – The baseline groundwater sampling reported is inadequate (only three samples from well P1M1, one sample from well P1M2 and three samples from well P1M3 taken over a two month period). There is also doubt over the representativeness of groundwater samples due to fresh water remaining in the groundwater wells after flushing of the well screen. The last reported data is from 6 months ago.

- Appendix A, section 7, page 42, 4.9 – The claim of ‘adsorption potential of the groundwater saturated material is likely to be significant’ is unsubstantiated, and thus attribute 4.9 has not been met. Substantiation is required to meet this attribute, including chemical analysis, column leach tests etc.

- Appendix A, section 7, 7.6 – Not enough information has been provided to determine whether or not this attribute has been met.

- Appendix A, section 7, 8.3 – It is considered that this attribute relating to long term water quality will not be met by the proposed three years of post-shutdown groundwater monitoring. Justification for this timeframe should be provided.

- Appendix A, Appendix B – Very high concentrations of ammonia as N and Total Kjedahl Nitrogen are reported, however these are not mentioned or reported in the body of the main document (Table 4-6).

- Appendix A, Appendix B – High pH values are reported for P1M2 and P1M3, including a rapid increase in pH in well P1M3 from 8.22 to 11.2 over a three week period. This increase should be discussed.

Draft Statement of Environmental Objectives (SEO)

Groundwater Assessment

- Page 8, Table 1, row 2 – 'Gasifier buffer zone' should be defined via use of a figure or similar

- Page 8, Footnote 2 – It should be noted that appropriate background groundwater quality averages have not been yet been collected and analysed for.

Should you require further information, please contact David Daminato via telephone 8204 2195 or via email david.daminato@sa.gov.au

Yours sincerely,

Greg Tyczenko

MANAGER
MINING AND RADIATION BRANCH
ENVIRONMENT PROTECTION AUTHORITY

Date: 1 March 2018

From:	Nash, Mark (Health)
To:	Spencer, Jarrod (DPC)
Subject:	RE: Request For Comments - Leigh Creek Energy - In-Situ Gasification Demonstration Plant EIR and Draft SEO
Date:	Monday, 29 January 2018 10:23:11 AM
Attachments:	image001.jpg

G'day Jarrod, hope you are easing into the New Year well!?

I've had a good look at these docs and have the below comments to make on behalf of the Department for Health & Ageing;

EIR

-

- Pg 46 (3.11.3) – Thought that this section could make mention of reference to the *South Australian Public Health (Wastewater) Regulations 2013*. Only because it makes reference to the possibility of a holding tank for wastewater (with removal to offsite by pumping). My discussions with them have suggested a simple septic/soakage system onsite so it may be best to keep this section broad whilst in the planning phase?
- Pg 135 (Table 5-4) – good reference made to Regulations here
- Table 7-1 Stakeholder Consultation – not that we feel left out but there is no reference to the DHA – it may look good for LCE to include us as they have had discussions with us so I would take it that that falls under Government consultation.

SEO

-

- Good reference made to the Regulations in Objective 13.

Cheers

Mark

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From: Spencer, Jarrod (DPC)
Sent: Friday, 12 January 2018 3:54 PM
To: DEWNR:Mining Referrals <DEWNRMiningReferrals@sa.gov.au>; DEWNR:SAAL NRM Aridlands <DEWNR.SAALNRMAridlands@sa.gov.au>; DEWNR:SMK Mining Assessments

<DEWNR.SMKMiningAssessments@sa.gov.au>; Schutz, Adam (DEWNR) <Adam.Schutz@sa.gov.au>; EPA:Mining & Petroleum Referrals <EPAMining&PetroleumReferrals@sa.gov.au>; Nash, Mark (Health) <Mark.Nash@sa.gov.au>; DPTI:Land Use CoOrdination <DPTI.LandUseCoOrdination@sa.gov.au>; Webb, Lee (DPTI) <Lee.Webb@sa.gov.au>; DPTI:North <DPTI.North@sa.gov.au>; Wong, Chor (AGD) <Chor.Wong@sa.gov.au>; Thomas, Roger (DSD-AAR) <Roger.Thomas@sa.gov.au>; Langeberg, Perry (DSD-AAR) <Perry.Langeberg@sa.gov.au>; DSD-AAR:Correspondence <DSDAARCorrespondence@sa.gov.au>; Bowman, Troy (PIRSA) <Troy.Bowman@sa.gov.au>; Russo, Anna (DSD-AAR) <Anna.Russo@sa.gov.au>; Antoun, Jackie (DSD-AAR) <Jackie.Antoun@sa.gov.au>; Peter.Baker@environment.gov.au; DPTI:Outback Communities Authority <DPTI.OutbackCommunitiesAuthority@sa.gov.au>; Sutton, Mark (DPTI) <Mark.Sutton@sa.gov.au>; Lewis, Bianca (DEWNR) <Bianca.Lewis@sa.gov.au>
Cc: Wilson, Tim J (DEWNR) <Tim.Wilson2@sa.gov.au>; Hodder, Mike (DEWNR) <Mike.Hodder@sa.gov.au>; Langrehr, Josie (DEWNR) <Josie.Langrehr@sa.gov.au>; Horgan, Melissa (DEWNR) <Melissa.Horgan@sa.gov.au>; Carson, Melanie (DEWNR) <Melanie.Carson@sa.gov.au>; Tyczenko, Greg (EPA) <Greg.Tyczenko@sa.gov.au>; Bunn, Stacey (DPC) <Stacey.Bunn2@sa.gov.au>; Howell, Scott (DPC) <Scott.Howell@sa.gov.au>; Sampson, Lloyd (DEWNR) <Lloyd.Sampson@sa.gov.au>; Daminato, David (EPA) <David.Daminato@sa.gov.au>; Wenham, Dale (DPC) <Dale.Wenham@sa.gov.au>; Paul, Stuart (DEWNR) <Stuart.Paul@sa.gov.au>; Stewart, Mark (DPC) <Mark.Stewart2@sa.gov.au>; De Ionno, Paul (DPC) <Paul.DeIonno2@sa.gov.au>; Walker, Sam (DPC) <Sam.Walker@sa.gov.au>; Malavazos, Michael (DPC) <Michael.Malavazos@sa.gov.au>; Annear, Jack (DPC) <Jack.Annear@sa.gov.au>; Sapa, Piotr (DPC) <Piotr.Sapa@sa.gov.au>; Baird, Rohan (DEWNR) <Rohan.Baird@sa.gov.au>; Lewis, Adam (EPA) <Adam.Lewis@sa.gov.au>
Subject: Request For Comments - Leigh Creek Energy - In-Situ Gasification Demonstration Plant EIR and Draft SEO

Hi All,

Leigh Creek Energy has prepared an Environmental Impact Report (EIR) and Draft Statement of Environmental Objectives (SEO) for the construction and operation of an In-Situ Gasification (ISG) Demonstration Plant at Leigh Creek. The demonstration plant will involve establishment of a single gasifier chamber and above-ground infrastructure to produce synthesis gas (syngas) for a short period (approximately 2-3 months), so that the syngas composition and performance of the process can be confirmed.

In preparation of the EIR and draft SEO relating to these activities Leigh Creek Energy commenced an initial stage of targeted stakeholder consultation in June 2017. This notice is provided to initiate a further stage of stakeholder consultation as required under the P&GE Act.

The Minister for Mineral Resources and Energy is seeking public comment, under provisions of the P&GE Act, on the following EIR and proposed draft SEO relative to this proposal:

- EIR, Leigh Creek Energy, ISG Demonstration Plant, December 2017;
- Draft SEO, Leigh Creek Energy, ISG Demonstration Plant, December 2017; and
- DPC's Environmental Significance Assessment, completed on the basis of information provided in the EIR.

Pursuant to Section 98 of the Act, DPC has classified the proposed activities as **medium impact**.

As such, DSD intend to make the EIR and draft SEO available for public consultation; DSD intends to send the EIR and draft SEO to targeted stakeholders as well as publishing a public notice in the Advertiser on Saturday 13 January 2018. Please feel free to distribute these documents further through your networks.

Please note due to the size of the EIR and draft SEO documents, we suggest accessing them from the DPC-ERD website at the following address - petroleum.statedevelopment.sa.gov.au/latest_updates/invitation_for_public_comment_-_seoeir. The Environmental Significance Assessment is attached.

DPC seeks comments on the EIR and draft SEO from government departments by close of business on the **26 February 2018.**

If you have any questions regarding this process or the attached documents please don't hesitate to contact me on 8463 3588 or via email at jarrod.spencer2@sa.gov.au

Regards

Jarrod Spencer
Senior Environmental Officer, Regulation and Assessment
Engineering Operations Branch
Energy Resources Division
Department of the Premier and Cabinet

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DX 541

EMAIL to Department of Premier and Cabinet

Energy Resources Division

Government of South Australia
SafeWork SA

Response to request for comment on Environment Impact Report (EIR) and Draft Statement of Environmental Objectives (SEO)

TO: Jarod SPENCER

CC: Chor Wong, John Garvey

SUBJECT

Request for comment - Leigh Creek Energy - In-Situ Gasification Demonstration Plant EIR and Draft SEO

CONTEXT

Leigh Creek Energy has prepared an Environmental Impact Report (EIR) and Draft Statement of Environmental Objectives (SEO) for the construction and operation of an In-Situ Gasification (ISG) Demonstration Plant at the Leigh Creek coalfields.

The demonstration plant will involve establishment of a single gasifier chamber and above-ground infrastructure to produce synthesis gas (syngas) for a short period (approximately 2-3 months), so that the syngas composition and performance of the process can be confirmed.

The Department of the Premier and Cabinet requested comments on this EIR and draft SEO to SafeWork SA

The link below was accessed:

petroleum.statedevelopment.sa.gov.au/latest_updates/invitation_for_public_comment_-_seoeir.

Contents were downloaded as follows:

- EIR, Leigh Creek Energy, ISG Demonstration Plant, December 2017;
- Draft SEO, Leigh Creek Energy, ISG Demonstration Plant, December 2017; and
- DPC's Environmental Significance Assessment, completed on the basis of information provided in the EIR.

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COMMENTS

Comments in areas of relevance to SafeWork SA are described below and provided by **26 February 2018** as requested.

EIR, Leigh Creek Energy, ISG Demonstration Plant, December 2017

Note: Page numbers refer to the 242 pages of the EIR and Appendices documents.

- *Page16; Other Legislation*
  Comment:
  Applicable legislation also includes:
  - *Dangerous Substances Act 1979 (SA)*
  - *Electricity Act 1996 (SA)*

- *Page 23; Compounds directly generated by the ISG process*
  Comment:
  LCK has a duty to manage and control health and safety risks associated with hazardous chemicals as per requirements of the *Work Health and Safety Act 2012 (SA) and Regulations* and the relevant schedules including assessment of *Schedule15 hazardous chemicals* and thresholds for determination of the regulatory requirement as a Major Hazard Facility.

- *Page 23/24; Containment*
  "It is essential to manage pressures in the gasifier chamber so that gradients driving flow are inward"
  Page 26;
  "Wells are pressure tested prior to commencing operations"
  Page 29:
  "Diesel powered compressors to inject air into the well"
  "Piping and valves"
  "Piping, valves and pressure safety valves"
  "Flow metering and pressure control equipment"

  Comment:
  LCK has a duty to ensure compliance with WHS legislation and safe design and operations of pressure systems associated with the project. Project management should assess the regulatory requirements for pressure equipment as per the *Work Health and Safety Act 2012 (SA).*

  - For pressure vessels there is a requirement for design registration and in many instances plant item registration is required.

- For pressure equipment that is not required to be design or plant registration there is a requirement to ensure that it is designed to be safe whilst it is intended to be used.
- For piping there is a guidance standard AS 4041 *Pressure piping*. The definition for pressure equipment includes all supports, attachments, gauges, controls, and pressure relief devices.

  It is noted that:

  - Under corresponding WHS law *Petroleum and Geothermal Energy Act 2000 and Regulations 2013 Regulation 29 – Pipelines and flowlines*, unless otherwise approved by the Minister, the design manufacture, construction, operation, maintenance, testing and abandonment of pipelines and flowlines must be carried out in accordance with the relevant requirements of AS 2885 *Pipelines- Gas and Liquid petroleum*
  - American Society of Mechanical Engineers ASME B16.5 and ASME B31.3 standards for Pipe flanges and flanged pipe fittings and process piping ("the plant") is referenced in Table 3-3; Page 34 and the plant would need to be verified by an authorised ASME Inspector.

- Inspection requirements for pressure plant and equipment falls under the code of practice AS/NZS 3788 *In-service inspection for pressure equipment*. This will necessitate engaging a third party inspector to ensure compliance.

The Hazard and Risk assessment should consider all the pressure systems that may be incorporated into the project. This would typically include safe operating procedures while the equipment is in use and de-energising the system for safe shut down and isolation for adjustments, maintenance, repair and any other reasons to access the pressure systems. It is noted at Page 34, *"The engineering design* and *Safety in Design (SID) processes will include Hazard and Operability (HAZOP) study, Risk Assessments, Safety Integrity Level (SIL) Analysis, Hazard Construction (HAZCON) study"*

The environment is likely to be highly corrosive and corrosion management procedures should be in place to monitor the effects of corrosion on the pressure system together with regular draining of the system to minimise the effects of corrosion on a regular basis.

A dedicated method for lock out and isolation for the pressure system should be considered. This could be taken into account at the time of design so that it can be sectioned for ease of access and minimise disruption where sections need to be made available for maintenance, repair or modification.

- *Page 27; "Leigh Creek Coalfield Location"*
  "While the location within the footprint of a coal mine that is undergoing closure and rehabilitation introduces some operational complexities, these are considered to be manageable and are far outweighed by the advantages of the site. The demonstration plant site itself is located in an area where there is expected to be minimal activity during the mine closure and rehabilitation phase"

  Comment:
  - Under the *Work Health and Safety Act 2012 (SA)*, all Persons Conducting a Business or Undertaking (PCBU's) have responsibility and must discharge their duty to the extent to which they have the capacity to influence and control the matter, disregarding any attempt to "contract out" their responsibilities.
  - Risks to health and safety of persons (including the Public) from hazards associated with the *"operational complexities"* of the proposed ISG Demonstration Plant and the concurrent Mine rehabilitation activities being undertaken must be managed and controlled.
  - It follows that the PCBU in management and control of the ISG Demonstration Plant, and the Mine Operator (PCBU), must discharge their duty to the extent to which they have the capacity to influence and control the risks of the hazards that could affect each other's simultaneous activities ("the same matter").
    When more than one person has a duty in respect of the same matter, each person with the duty must, so far as is reasonably practicable, consult, co-operate and co-ordinate activities with all other persons who have a duty in relation to the same matter

- *Page 28 "Recommended Attributes for ISG Sites"*
  "Hydraulic head measured above the coal seam measured at 490 mm…"
  Comment:
  Question - should the hydraulic head measured above the coal seam be 490 metres?

- *Page 35; "Preventative controls and mitigation strategies for the demonstration plants"*
  LCK will implement an emergency response plan (ERP) to cater for emergency situations
  Page 140 & 141; Stakeholder Consultation
  Comment:
  LCK has a duty to prepare, maintain and implement an emergency plan.
  It is noted at Page 140 and 141 "*Stakeholder Consultation"* that:
  - There is no evidence of consultation with the primary emergency services organizations' with responsibility for the area in which the ISG Demonstration Plant ("the Plant") is proposed to be located and
  - Consultation and testing of the Emergency Response Plan with Stakeholders is advised prior to commissioning of the Plant.

- *Page 51-52; "Existing Environment - Overview"*
  "At present there are no ongoing mining operations and the coalfield has entered into closure planning."
  Comment:
  Incorrect - Mining operations include mine rehabilitation which is ongoing and includes:
    - Use of heavy earthmoving equipment for contouring of excavations and waste rock stock piles and
    - Spontaneous combustion control.

  For clarity, currently there is no coal mining operations being undertaken at the Leigh Creek Coalfields

- *Page 109; Note 13 at footer –*
  "The gasifier will not be operated at a pressure above 36 bar to ensure the safe operating pressure is not reached."
  Comment:
  How was the *"gasifier releasing stress up to 75m above the gasifier"* determined?
  Noted that the gasifier will not operate at a pressure above 36 bar.

- *Page 110; Gasifier chamber growth intersecting potential migration pathway*
  "The effect of heat and/or partial combustion on the roof rock of the gasifier chamber is currently under evaluation"
  Comment:
  Noted that *"additional roof collapse as a result of temperature generated by the gasifier could potentially reduce the success of gasification but could not feasibly result in chamber growth through 400m of overburden"*

- *Page 118; "Air Quality"*
  "Dust Generation"
  Comment:
  Management and control of risk to health and safety of persons regarding exposure to dust would include mitigation of visibility hazards. Dust suppression of unsealed roadways and works would be needed to control these risks.

  "Combustion emissions"
  Comment:
    - Controls to monitor and withdrawal persons when combustion and odour emissions exceed the exposure standards' would need to be managed.
    - Compressor diesel combustion engines and the like would need to be adequately located to minimise exposure of persons to diesel particulate matter.

- *Page 115; Spills or leaks of produced fluids*

  "if material was released from a loss of well integrity or explosion or fire, impacts would be localized and contained within the immediate vicinity…."

  Comment:

  Noted that control measures outlined in Section 5.2.1 and 5.9.3 are proposed to be implemented to minimise the risks of explosion or fire hazards

  .

  Section 17 of the *Work Health and Safety Act 2012 (SA)* requires the duty holder to eliminate risks to health and safety, so far as is reasonably practicable, or if not reasonably practicable, to minimise those risks so far as is reasonably practicable.

  Section 19 – Primary duty of care of the *Work Health and Safety Act 2012 (SA)* includes the requirements, amongst other matters, that a PCBU must ensure, so far as is reasonably practicable:

  - The provision and maintenance of a work environment without risks to health and safety,
  - The provision and maintenance of safe plant and structures,
  - The provision and maintenance of safe systems of work and
  - The provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to health and safety arising from work carried out as part of the conduct of the business or undertaking.

- *Page 135; "Use of roads; movement of heavy machinery and vehicles""*

  Comment:

  Each Person Conducting a Business or Undertaking (PCBU) retains responsibility and must discharge their duty to the extent to which they have the capacity to influence and control the matter, disregarding any attempt to "contract out" their responsibilities. The LCK (PCBU) has the capacity to influence traffic journeys to the EPL 650 work site of their own employees and other PCBU's, including contractors. The influence must extend to consultation with and alignment of various PCBUs health and safety policies, including managing fatigue which is a known causal factor of traffic incidents.

- *Page 138; "Incident Management, Recording and Corrective Actions"*

  Comment:

  The system will also need to provide a mechanism for reporting, recording and remediating "Notifiable incidents", as prescribed under the *Work Health and Safety Act 2012 (SA)*

- *Page 218; "Geotechnical Assessment for Demonstration Plant Gasifier"*
  Comment:
  Do the design earthquake loadings for the Site consider the potential for gasifier chamber induced seismic activity near or adjacent to faults?

Trust these comments are satisfactory to your needs

Regards,
Graeme SAUER
Principal Mining Engineer
SafeWork SA
Telephone: 83039960
Email: graeme.sauer@sa.gov.au

DEWNR Science Response Document last updated: 6 March 2018

Leigh Creek Energy ISG Demonstration Plant

Document: **Statement of Environmental Objectives**
Version:
Document Date: 20 December 2017

Comment No	Science Comment (to identify relevant section / paragraph and consider required actions)	Leigh Creek Energy Response	Addressed (Y/N)
1	Section 1.1 Purpose, 2nd para: Text edit - to add word 'construction' to the 1st sentence – …environmental objectives to which construction, operation and decommissioning… Also add to section 1.2 1st sentence – This SEO applies to the construction, operation….		
2	Environmental objective 2 – No sustained change to background groundwater at the boundary of the gasifier buffer zone. Further discussion is required regarding this environmental objective. Sustained change is defined (pg8) as water chemistry deviating more than 2 standard deviations from background averages. Therefore, changes to groundwater chemistry of up to 2 standard deviations are proposed to be acceptable, which could result in substantial changes to the background water chemistry. The potential magnitude of changes that could occur need to be reported. Information presented in the EIR/SEO documents include: • During operation, pressure within the gasifier is to be lower than groundwater pressure. • Groundwater movement at 1m/year or less.		

Comment No	Science Comment (to identify relevant section / paragraph and consider required actions)	Leigh Creek Energy Response	Addressed (Y/N)
	Based on these 2 facts groundwater contamination, should it occur is likely to occur within the immediate vicinity of the gasifier. Upon completion of the operational phase there will be a hydraulic gradient towards the gasifier chamber which will move any contamination back towards the chamber. Monitoring of water chemistry of groundwater within the chamber could determine the magnitude of groundwater contamination, removed as required and the length of time required for groundwater quality to return to background levels. The reported rate of groundwater movement means that groundwater will not move more than 1m over the duration of the trial. Design of the groundwater monitoring plan will need take this into consideration. What is the purpose of establishing a 100m buffer zone to measure groundwater quality and assess impacts on groundwater? To consider changing this environmental objective to 'No long-term change to background groundwater quality.' For discussion – is to establish an impact zone beyond which no change to baseline groundwater quality are to change.		
3	Table 1, environmental objective 4: The Assessment criteria does not match the environmental objective. Suggest rewording to 'There is no uncontrolled flow from a well.', or 'There is no uncontrolled flow to surface or subsurface.'		
4	Monitoring well locations: Provision of a cross section of the site through the inlet and outlet well displaying features including the approximate locations and well depths, VWP's, gasifier chamber and gasifier buffer zone would assist in the understanding of the project.		

Comment No	Science Comment (to identify relevant section / paragraph and consider required actions)	Leigh Creek Energy Response	Addressed (Y/N)
5	Section 3 Reporting: The groundwater monitoring plan which is to be developed will likely also have some reporting requirements. Reference to this should be made in the SEO.		
6	Table 2 Serious Incidents, item 5, 3rd dot point: To be consistent with the environmental objective suggest editing wording to 'Identification of uncontrolled flows to the surface of subsurface.'		

Document: **Environmental Impact Report**
Version:
Document Date: 20 December 2017

Comment No	Science Comment (to identify relevant section / paragraph and consider required actions)	Leigh Creek Energy Response	Addressed (Y/N)
1	Summary, pg 9, 3rd paragraph – a statement is made that there are no aquifers present at or near the demonstration site. Clarification is required regarding this statement as the EIR and work undertaken by Flinders Power have identified aquifers within the Telford Gravels and upper series overburden.		
2	Summary, pg 10, 1st paragraph – additional information is required regarding the additional groundwater and soil sampling that is to be undertaken. (What aquifer is to be sampled, locations of sampling, frequency, parameters to be measured, timing, etc.)		
3	Section 2.2.1, pg 17 - • clarification is required regarding the statement 'no matters of national environmental significance present or likely to be significantly impacted.' Statement appears to be a contradiction. • The paragraph does not consider aquifers in the underlying sediments or above the main series overburden. (refer comment 1)		
4	Section 2.2.4, pg 17: To note that well permits are also required for the modification to and for decommissioning of existing wells.		
5	Section 3.1.3 – What are the likely concentrations of ISG products and COPCs and how do these compare to existing baseline (background) values?		
6	Section 3.1.5 – How do the geology and hydrogeology of the Leigh Creek site compare with the examples of clean shut		

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	down achieved in Qld and USA and are any procedural variances required at Leigh Creek?		
7	Section 3.2 – due to the small area over which the EIR applies more detail regarding the construction of the wells could have been provided regarding formations / lithological units, casing diameters strength and materials. A site specific schematic diagram of well would be useful. What is the official grade of 'premium casing'?		
8	Table 3.2, pg 28: • row 8 – Comments field states site is located approximately 100m south of an inferred fault. This does not match the 2nd dot point in section 3.3.2 on pg 27. • Row 4 – comments field – is the unit of measure mm or m (490mm).		
9	Table 3.4, pg 35, 1st row – Description ignores the presence of Telford gravels.		
10	Section 3.9, pg 41, last paragraph -if any of the water wells are of use to Flinders Power for closure monitoring, consideration to be given to transfer of wells prior to decommissioning.		
11	Section 3.10, pg 42, groundwater quality, • 1st paragraph – groundwater sampling should also be undertaken prior to the commencement of operation to determine baseline levels for ISG products and COPCs. • When is the groundwater monitoring plan to be developed. To note that monitoring information presented in the EIR may be changed when the groundwater monitoring program is developed. The monitoring plan is to be approved by regulators prior to commencement of activity. • Various purposes of monitoring wells may be required – compliance wells and wells to detect impact. The rate of		

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	groundwater movement is very low therefore well to measure impact will need to be close to the gasifier chamber. Groundwater movement of <1m/year has been presented in the report, therefore, the placement of wells at 50m from the gasifier chamber will need to be reviewed. • Due to the slow rate of groundwater movement post-operation monitoring beyond 3 years may be required. • Use of the term compliance rather than sentinel • Monitoring of units underlying the gasification chamber also need to be considered.		
12	Section 3.10, pg 43, groundwater temperature – groundwater temperature to be measured concurrently with water levels to account for temperature effects on the water levels.		
13	Figure 4.8, pg 67 and table 4.4, pg 69 – there is conflicting information as to the geological age of the coal seams. An explanation as to the difference is required.		
14	Figure 4.14, pg 75 – the figures for hydraulic conductivity and groundwater velocity are for different parameter scenario. Refer to section 5.1.1 in appendix A. A hydraulic conductivity of 10^{-7} corresponds to a velocity of mms/yr whilst a hydraulic conductivity of 10^{-3} corresponds to a velocity of m/yr. This is repeated on a number of figures in the report.		
15	Section 4.7.1.3 and Table 4-5 – water quality categories should be as per the EPP Water Quality.		
16	Section 4.7.2, pg 81 – It would be useful to display the natural springs on a map to show their location with respect to the trial site.		
17	Section 4.7.3, pg 81 – Possible connection of the Telford Basin to the regional fractured rock aquifer has not been		

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	addressed. LCK to consider presenting a regional potentiometric surface. Information presented by Flinders Power supports a through flow system trending south – north.		
18	Section 4.7.6, pg 91, 1st dot point – use of the term beneficial use. The reported groundwater quality suggests that the groundwater has a beneficial use. In the context of the sentence are LCK referring to existing users?		
19	There are aspects of the ISG activity that are mentioned for the 1st time in chapter 5 Environmental Impact Assessment rather than in the previous chapters 3 (Description of Activities) or 4 (Existing Environment) • Section 5.2.2.1 – High absorption properties of the coal and carbonaceous mudstones. Details / references are required on this topic. Has it been measured on site?		
20	Section 5.2, pg 107 – groundwater receptors. The main series pit, located to the north of the demonstration site is considered a groundwater receptor and potential impacts to the pit need to be addressed in the EIR.		
21	Table 5.4: • Refer to comment 20, consideration of the main series pit as a groundwater receptor needs to be addressed in the relevant risk events in the table. • Risk event sub group – loss of containment underground has restricted the potential environmental impact to shallow groundwater for a number of risk events. Why has only shallow groundwater been considered rather than groundwater in general?		
22	Sections 6.1 and 6.3, it is not clear if the various monitoring plans are part of the EMS. If they are section 6.3 to be inserted into section 6.1.		

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Appendix A			
23	Section 1 Exec Summary, • Pg 2, 2nd paragraph – editorial - consistency in reporting of age of deposition – 240-190 million years stated in exec summary, yet 250-200 stated in chapter 3. • pg 3, 5th paragraph – use of the term foreseeable future. This is subject to misinterpretation and it is preferred if a year range is presented. In paragraph 6 it is stated that it is expected to take between 2 to 20 years for groundwater to reach equilibrium with the surrounding strata.		
24	Figure 3.6, pg 16 – to consider displaying drainage lines to statement that drainage is to the north and east.		
25	Section 3.2, pg 16, 1st paragraph – ponding of surface water could also have recharge the shallower Telford Gravels		
26	Section 4.3, pg 22 – some discussion is required explaining the interpretation of figure 4.3.		
27	Section 4.4, pg 22 – details of the 'swabbing' sampling technique are to be provided. This could be included in the groundwater monitoring plan.		
28	Figure 4.5, pg 24: • comments are required to explain the anomalies (sudden changes in trends) in the VWP data. • Are these the same VWPs displayed in figure 4.1? Different VWP naming convention has been used.		
29	Section 4.5, pg 25, 2nd paragraph – The last sentence states that a salinity profile needs to be run on well 3967, yet a salinity range is reported for the well in the start of section 4.6. Are these values suitable for calculating an accurate pressure at the monitoring depth? LCK to comment.		
30	Section 5.1, pg 34 –reference has been made to the use of a numerical model in the conceptualisation of groundwater		

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	movement. Details of this model have not been provided for assessment.		
31	Section 5.1.2, pg 35 – reference is made to a radius of influence of the gasifier on surrounding groundwater. Additional information is required as to what is the anticipated size (as a range) of the radius of influence. This information can also be used in the design of the groundwater monitoring program.		
32	Section 5.1.4, pg 36 – consideration is to be given to sampling the groundwater in the gasification chamber post operation to determine the extent of residual COPCs and whether additional remediation activities are required.		
33	Section 6.1, pg 39: • Editorial - There is no section 3.3.4 in the appendix. • To note that the reported groundwater qualities in table 4.8, give the groundwater a beneficial use suitable for stock. LCK to comment.		
34	Section 7, pg 42, item 4.8 - baseline water quality sampling to date has shown potential contamination resulting from well construction. Is additional baseline sampling planned?		