s. 47G(1)(a) **- Admin**

From: s. 47G(1)(a)
Sent: Saturday, 17 July 2021 1:34 PM
To: secretary_cdil@hotmail.com
Cc: s. 47G(1)(a)
Subject: Arrow Energy CSG Activities
Attachments: Downwards ground movement Graph Regional Daadine Arrow Energy 26 March 2021.pdf; Bogaroo Cultivation of fields prohibited by Arrow Energy.pdf

s. 47F(1) thank you for returning my call yesterday. Here is a summary of practical issues from our experience as irrigators in an operational CSG field.

Background

As you know one of our properties backs onto Arrow Energy's Daandine CSG field near Kupunn.

Our property is classified as priority agricultural area (PAA) intersected by Wilkie Creek. West of the creek is priority agricultural land use (PALU) dryland cropping and east of the creek is primarily PALU irrigated cropping with two irrigation water storage dams (1,200 + 800 megalitres).

There are no CSG wells on our property. There are 16 CSG wells on neighbouring properties, 15 of which are within 50m of the common boundary, the other a little further away.

Four of these wells were drilled in 2009 and started production around 2015. They are on the western side of the creek surround a field known to us as Field 10. A considerable amount of water drains through Field 10 from grazing land further to the west which has been fully developed for CSG (Daandine CSG field). In the first half of 2020 we noticed that water was ponding on the western side of the field. Water previously had drained to the creek, thus not causing any disruption to cropping. To overcome the problem so we could plant winter crop, we installed 3 emergency temporary drainage channels in Field 10 using our Wolverine dirt slinger. These channels were about half a metre deep.

We started asking questions about CSG subsidence in June 2020. As you know at that time the Arrow Energy prediction of CSG subsidence was 3mm – 5mm subsidence per 1km, and the type of data Arrow was using to collect a baseline of surface level and monitor changes (satellite ie. InSAR) was unable to collect reliable data for 'ploughed fields'. Broadly speaking OGIA explained to us at SSAG that the mechanism of CSG subsidence is that as water is pumped out of the coal seams to release the gas, the coal collapses as it is does not have the structural ability to support the overlying strata. This slumpage is reflected on the surface in the same random pattern the coal seams are underground.

For our property Arrow is relying on LiDAR (aerial survey) data which I understand it collected from some of its project area in 2012 and 2014, and late 2020 data which it collected after I started asking questions at a Federal level as to how surface subsidence was going to be monitored in all of the cultivation area of the project given InSAR was not able to be used.

Arrow at first evaluated the subsidence we reported on our property using aerial and satellite photographs. When we insisted on a numerical evaluation, which from our reading was required under the federal conditions, Arrow conducted its own analysis using its own data and confirmed we had subsidence. Arrow has not consulted with us in the evaluation, or from what we know sought any agronomic advice, and continues to maintain that we have suffered no impact to our land use. An example of the impact on us is this season winter crop planting. We waited for a rain prediction then planted the field by lifting the planter out of the ground and dropping the seed on top of the ground in the areas of water pondage as they were still too wet to get the planter through, then re-engaging the planter on the other side of the depressions.

We are drawing the attention of CDIL to some of the practical considerations we come across which should be of interest to CDIL executive.

1. The LiDAR survey data being used for surface subsidence.

Our recent understanding of the Resource legislation and regulations is that Arrow is required to have either provided landholders with a notice of entry to fly the survey, or applied to Government for an exemption which we understand would the involve public notification of the survey including details of what days it was to be flown. It is important for the landholder to know when the survey is being done as that gives the landholder the opportunity to record the cropping and soil conditions in the field, and record any water that may be standing or running in the field at the time of the survey. Our understanding is the type of LiDAR survey being used is unable to penetrate water, so any water in field will mask the actual level of the ground and provide a false result.

As we noticed new areas of water pondage in our Field 10 after the rain in April 2021, Arrow said they were flying another LiDAR survey in June 2021, but refused to provide a notice of entry so we do not know what date that was flown. As a result we were unable to record actual field conditions on the day. We did raise the issue with Resources Department at the time, they are still working on figuring out if the regulation which says the owner of the land must be given notice of entry for survey means the owner of the land must be given notice of entry for survey or not. Of note is the Resource Department's own Notice of Entry form which Arrow Energy must use to give any type of Notice of Entry to Private Land lists aerial survey as example 1 Entry notice for private land (resources.qld.gov.au)

It is now mid-July 2021 and we have received no evaluation of the new areas of pondage in Field 10.

The regulations require Arrow Energy to lodge raw survey data with Resources Department, but the practice guideline I found does not list any type of surface level data as required to be currently lodged so we can assume that Resources does not have a copy of any of the raw InSAR or LiDAR data. The regulations say that the confidential period for the survey data is 3 years. This means that even if Resources had a copy of the data, the landholder could not access it for 3 years. This is a large problem for landholders as without the raw LiDAR data, Arrow owns the data, processes the data, evaluates the data, and proclaims the impact on land use when it has a vested interest in the outcome of the data. As an adverse outcome would have enormous implications in terms of financial cost of compensation to landholder, state & federal environmental conditions, and priority agricultural area requirement not to cause harm this creates a substantial conflict of interest for Arrow Energy.

Early in 2021 prior to lodging complaints with Government we were to obtain the processed LiDAR data for 2012, 2014, and 2020. We then quickly discovered that LiDAR data was very easy to manipulate into saying any number of outcomes due to having to be processed to remove vegetation layers. Thinking about Field 10 and what was and was not showing on the Arrow evaluation, we asked for and received the raw LiDAR data. Recently we have attempted to have that independently processed, and found that we can't use it accurately for comparing year to year as Arrow did not give us the metadata files that must go with the raw data. The metadata files apparently specify essential processing parameters like date of survey, vertical inaccuracy and horizontal inaccuracy. This leaves us and every other landholder with no ability to get an independent opinion. We were able to find out that ignoring any processing or interpretation, the 2012 and 2020 processed data we were given likely originated from the raw data files we were given for those years. However that is not clear for the 2014 data, which happens to be the year Arrow is using as a 'baseline' for Field 10. Also, we found out that LiDAR data is able to be "patched" i.e. a section of data is able to be removed and replaced if say there was an issue with the survey that needed fixing. There is apparently a strange patch over our property in the LiDAR data, but the metadata file should provide information on that, except we have not been given the Metadata file.

We have asked Arrow for the metadata files a couple of times, but they have not given it to us.

The LiDAR data being used by Arrow it says in their report has a vertical inaccuracy of 100mm for 2012 and 2014 and 50mm for 2020. The horizontal inaccuracy is not specified but I have been told by an independent person this is usually for aeroplane LiDAR about 1 to 1.5 meters. The band that Arrow says it regards as stable is 150mm.

To avoid the conflict with Arrow, we are in the process of getting our own RTK survey done by a licenced surveyor, but it is of course too late for the 100ha+ which is Field 10.

Arrow Energy directionally drilled 5 wells onto our property in 2018 and 2019 without notifying us and have been operating those wells.

Our recommendation is that everyone needs to be prepared to organise and pay for their own survey prior to Arrow showing up to drill any wells anywhere in their vicinity as our experience is the information required by the Federal and State Environment will not protect you, and in any case you are not able to access it to get your own independent evaluation done. It seems to be that you have prove that Arrow have caused you a problem, not Arrow has to prove they have not caused you a problem. Also, if you are in an area that pumps irrigation water from the Condamine Alluvium, we suggest you need to get a survey now so that you can prove the amount of subsidence that is occurring from groundwater extraction, as without that how will any irrigator be able to prove that the subsidence is from the CSG? Where we are at Kupunn is a considerable distance from any irrigation bore, as we are on the western edge of the Condamine Alluvium there.

2. The Federal Environment EPBC 2010/5344 WMMP subsidence screening, investigation and trigger levels for surface subsidence

As a result of our visit to the Federal Minister of the Environment in February 2021, Arrow Energy has submitted a revised WMMP with amended levels. Arrow have not made their revision public and it is not on their website as I don't think it has been approved yet by the Minister. At the Arrow meeting in Dalby in May 2021 for Kupunn, Arrow said they were revising the investigation level for land with slopes of <0.06 to 50% of that level. The current levels are they only have to investigate subsidence to cultivation if the field is irrigation and the AVERAGE subsidence in 1km2 (i.e. 100ha) is 300mm, so I can't see much effective change there other than dryland has been included when it seems it was completely omitted from the existing WMMP. Over at Kupunn there is a lot of area that is on 0.06 or less so any reduction in slope will likely start having some serious yield impacts from water pondage. Also there is the issue of they only have to have 1 data point in each 100ha, so bad luck if the subsidence is not where the data point hits.

3. Drilling of bores

Arrow Energy notified us and other Kupunn/Ducklo landholders in April 2021 (after we lodged complaints with Government) that they had directionally drilled onto our land without notifying us, i.e. they had entered on our properties illegally.

We have 5 wells. As we were looking to drill a domestic water bore we have been trying to find out the safe distance we can drill a water bore to an aquifer above the CSG wells or below the CSG wells. In our location we are entitled to drill a domestic water bore to any aquifer of our choice and we are not restricted to being within 10m of an existing bore if there is no livestock use. Due to water bore history in the area where we are, the Hutton and Precipice which are below the coal measures are the most viable aquifers. We asked Government the minimum distances. They said there is nothing in the regulations or legislation, ask Arrow Energy. We did ask Arrow Energy in early June 2021. Arrow Energy responded by placing a blanket restriction across the entirety of our property through Dial Before You Dig for the following activities (a) drilling a vertical water bore up to 900m (b) mechanical excavation or manual excavation (c) surface disturbance.

This means we cannot drill a water bore anywhere to any depth, maintain our irrigation dams or infrastructure with an excavator, any machinery or a shovel, and we cannot do any crop preparation as we are not allowed under the Arrow specified terms and conditions to do anything other than dig with our hands across the entirety of our property.

This is a significant problem as how we read it is the terms of our farm public liability insurance policy say that we are liable for any damages when we ignore Dial Before You Dig duty of care requirements imposed by the infrastructure owner. The Arrow Energy Dial Before You Dig terms and conditions (copy attached for one of the searches, not for distribution or sharing) seem to say we are totally liable to them and they have not responsibility for the accuracy of their maps or liability to us for anything.

This all really does sound very stupid, but the legal implication is that as we understand it we are now potentially in default of our bank loan facility as we are required to operate with insurance, and by doing

field work which contravenes DBYD we are operating without insurance in that we are fully liable to Arrow Energy should they claim our activities have damaged their infrastructure. So that means if the bank decides, foreclosure at any time within 90 days or less.

We have discovered that Arrow is required to follow the code of construction of petroleum wells which requires it to have ground truth-ed the trajectory of the well and talked to the landholder about the landholder constraints and any environmental issues on the property. Obviously that didn't happen with the 5 wells on our property. The point is though that Arrow drilled those wells wherever they liked so for a property for irrigation water bores I can't find anything that would currently restrict Arrow from drilling directly underneath an existing irrigation water bore. Which means they can drill where ever they like and as an irrigator you can't stop them. Arrow has drilled a directional well diagonally across almost the full extent of our 1,200 megalitre ringtank with the well head being on the neighbouring property about 90m from our dam wall.

If we had an irrigation bore, we would be currently unable to replace it on our property as (a) Government cannot tell us how far away we must be from the directional well vertically or horizontally (b) Arrow Energy isn't telling us the distance and (c) Arrow Energy has restricted all digging and soil disturbance on our property unless we dig by hand to identify the location of their infrastructure first.

From my reading of the Qld standards to drill water bores – which directs to the Australian standards, it is mandatory that the landholder bears the liability for the siting of the water bore and in Appendix C which is the sample contract between the landholder and the driller, the landholder indemnifies the driller for any problems or liabilities that arise from the drilling.

4. Are landholders with directional wells that enter from next door entitled to a CCA which would give them some security and control?

Arrow says no as they claim the directional wells cause no or only minor impact to the land or business of the landholder. Resources Department has been saying for months it's a case by case basis and has taken no apparent steps to assist any landholders with the problem. If Resources Department came out and said Kupunn Landholders were entitled to a CCA I assume this would delay Arrow Energy who I have heard has gas supply agreements that it has signed that require it to supply gas in March 2022. Landholders cannot access the Land Access Ombudsman as they do not have an existing CCA.

I cannot find a definition of 'minor impact' in the Resources legislation, but examples given in the MERCP Act section 15B of activities with minor impact are •walking the area of the authority •driving along an existing road or track in the area •taking soil or water samples •geophysical surveying not involving site preparation •aerial, electrical or environmental surveying •survey pegging.

Department of Environment & Science approved the Arrow Energy Surat Gas Project Environmental Impact Statement which says in Chapter 7 at Table 7.5 that the definition of minor is: 'Minor' means localised short-term effect – some limited consequence but no significant long-term changes, may be easily rehabilitated. https://www.arrowenergy.com.au/__data/assets/pdf_file/0007/28681/Chapter200720-20Impact20Assessment20Method.pdf

Table 7.5 Qualitative criteria for consequence

Descriptor	Description
Severe Widespread serious long-term effect	Extreme permanent changes to the environment, major public outrage, or the consequences are unknown. Serious environmental harm that causes actual or potential environmental impacts that are irreversible or of high impact or widespread. Likely prosecution by regulatory authorities.
Major Wider spread, moderate to long-term effect	Substantial and significant changes that will attract public concern, are only partially able to be rehabilitated or uncertain whether it can be successfully rehabilitated. Actual or potential environmental harm either temporary or permanent, requiring immediate attention. Possible prosecution by regulatory authorities.
Moderate Localised, short-term to moderate effect	Significant changes that may be rehabilitated with difficulty. Direct or indirect environmental impacts beyond location (onsite or offsite). Repeated public concern. Reportable to the government.
Minor Localised short-term effect	Some limited consequence but no significant long-term changes, may be easily rehabilitated.
Negligible No impact or no lasting effect	Possible impacts but without noticeable consequence. Temporary or short-term reversible environmental impact, localised event, location of little environmental value.

5. Practical aspect of Arrow Energy's current subsidence prediction

Arrow Energy has been presenting their current prediction of surface subsidence (attached). Their prediction (which we assume is their best case scenario) of about 80mm AVERAGE within 500m of the well (or presumably directional well path) and about 60mm within 1km is in our view going to significantly reduce the yield in some if not all of our irrigation fields as the existing slope is minimal. To enable us to continue to irrigate those fields after the subsidence predicted by Arrow has occurred, we will need to laser level our fields, probably more than once. Note this is not our prediction of whether or not subsidence will occur, Arrow Energy said publicly the subsidence will happen. They have also only given a prediction for only a 15 year period, when some of the reading we have done on the subject authored by CSIRO and Monash University suggests subsidence will continue on for at least 60 years.

Of note is that Arrow's prediction in the attached PowerPoint is based on "5 years of real data attached to wells up to 15 years old", when actually their wells in the Daandine field started production in 2009. So why not all the data, and which 5 years of data has been selected?.

What we are seeing in dryland Field 10 are uneven shaped sink holes that are not linked together so they do not drain. This has significant implications for irrigation fields.

We have also become aware of a project known as AGOS associated with Geoscience Australia which we understand used InSAR and ground truth survey across a number of years in an area stretching from east of Dalby to Miles encompassing at least some of Jimbour Plain and the operating CSG fields in the mid 2020s. Heresay is this revealed subsidence of 150mm+ across the operational CSG areas. AGOS project data has not been publicly released as far as we are aware.

6. Nature and Extent of Wells

The legislation says the landholder must be provided details of the nature and extent of the wells. Arrow says this means a diagram of the well depth at entry and terminus and a coordinate for the entry point to the land and the terminus of the land. Missing is the downhole survey and casing details giving the actual nature and extent of the wells. From the perspective of subsidence, we need to know the strata and casing details so we can work out where the maximum drawdown might be and extraction points along the directional wells. From being able to drill a water bore perspective we need the downhole survey as that will reveal the actual path of the directional well, including any side-tracking of the well. Resources Department has not given us any outcome on the information we are entitled to receive.

7. Other Possible Complications

As the subsidence develops the strata layers will slump. Presumably this will cause random fracturing through underground aquifers.

Sincerely,

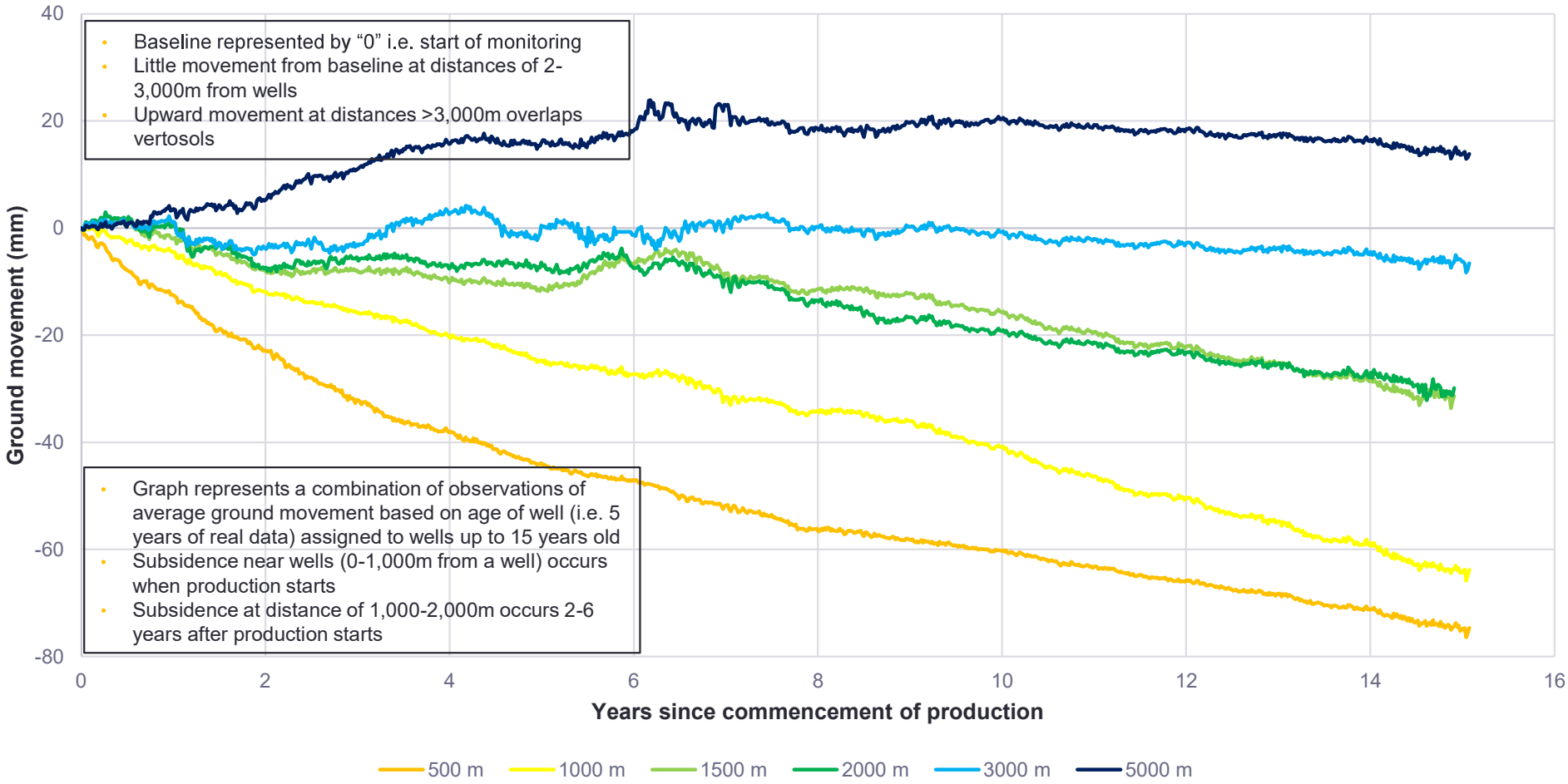
s. 47F(1)

s. 47G(1)(a)

s. 47F(1)

2 Relationship between ground movement & age of CSG wells; Daandine

arrow energy
go further



Job No 30124235

Phone: 1100
www.1100.com.au

Caller Details

Contact: s. 47F(1)
Company: Not supplied
Address: s. 47F(1)

Caller Id: s. 47F(1) **Phone:** s. 47F(1)

Email: s. 47G(1)(a)

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.

s. 47F(1)

User Reference: Cultivation of Fields
Working on Behalf of: Private
Enquiry Date: 15/07/2021
Start Date: 25/07/2021
End Date: 30/07/2021
Address:
s. 47F(1)

Job Purpose: Excavation
Onsite Activities: Non-Destructive Digging
Location of Workplace: Private
Location in Road:

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:

All activities relating to tillage and production of crops on intensively farmed land and irrigated land

Your Responsibilities and Duty of Care

- The lodgement of an enquiry does not authorise the project to commence. You must obtain all necessary information from any and all likely impacted asset owners prior to excavation.
- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days.
Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash # require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
200714600	Arrow Energy NL	(07) 3012 4374	NOTIFIED
200714601	Energy Infrastructure Management 2	(07) 3020 2610	NOTIFIED
200714598	Energy Infrastructure Management 3	(07) 3020 2610	NOTIFIED
200714597	Ergon Energy Corporation Ltd 5	13 10 46	NOTIFIED
200714596	QGC	(07) 3024 9474	NOTIFIED
200714599	Telstra QLD Regional	1800 653 935	NOTIFIED

END OF UTILITIES LIST

Dial Before You Dig (DBYD)

Pipeline Location Information

Arrow Energy
GPO Box 5262
Brisbane Queensland 4001
Australia

To: ('Enquirer')

s. 47F(1)

Enquiry Details	
Utility ID	90043
Sequence Number	200714600
Enquiry Date	15/07/2021 19:33
Response	**AFFECTED**
Address	s. 47F(1)
Location in Road	
Activity	Non-Destructive Digging

Enquirer Details	
Customer ID	3022034
Contact	s. 47F(1)
Company	
Email	s. 47G(1)(a)
Phone	s. 47F(1)

Enquirer Responsibilities

DUTY OF CARE STATEMENT

The Applicant: Zena Ronnfeldt ,

1. The Applicant acknowledges and agrees to the following:

A. The Applicant has a legal “Duty of Care” that must be observed, particularly when working in the vicinity of Arrow’s Infrastructure.

B. Infrastructure includes (but is not limited to) gas pipelines, water pipelines, underground metal and plastic pipes, conduits and other associated underground equipment.

C. When discharging its “Duty of Care” in relation to Arrow, it is the Applicant’s responsibility to:

i) Ensure that during the project planning stage, the Applicant designs for minimal impact and protection of Arrow’s Infrastructure;

Ii) Anticipate and request plans of Arrow’s Infrastructure for a particular location at a reasonable time before construction begins; and

iii) Visually locate Arrow’s Infrastructure by hand digging where any works may damage or interfere with Arrow’s Infrastructure.

D. The Plan and/or details and any other accompanying information (**Plans**) advise of the proximity of the Infrastructure that are operated by Arrow on, at or in the area specified.

E. Plans provided by Arrow are current for one (1) month from the date of despatch and should be disposed of by shredding or any other secure disposal method after use.

F. Arrow will provide free plans if an Arrow Infrastructure location request is made via Dial Before You Dig on Freecall 1100 or via the website www.dialbeforeyoudig.com.au and at least three (3) business days notice is given. Arrow does not provide information on private underground installations.

G. Arrow retains copyright in all Plans provided in connection with the Applicant’s request.

H. Arrow’s Plans are provided for the use of the Applicant and the Applicant’s officers, employees, agents, representatives, contractors and subcontractor only and must not be used for any unauthorised purpose.

I. Arrow Plans are indicative only of the location of the Arrow Infrastructure. The Applicant acknowledges that the Plans do not provide exact ground cover and alignments as this cannot be given by Arrow with any certainty (as such levels can change over time).

J. On receipt of the Plans and before commencing excavation work or similar activities near Arrow’s Infrastructure, the Applicant must carefully locate Arrow’s Infrastructure to avoid damage. Vacuum excavations are considered to be excavation and are not permitted without an “Authority to Work” permit and possibly a site watch. However obtaining the “Authority to Work” permit shall be the sole responsibility and liability of the Applicant.

K. Arrow and Arrow’s officers, employees, agents, representatives, contractors, subcontractor and other permitted invitees shall not be liable for any loss or damage caused or occasioned by the use of Plans supplied to the Applicant and its officers, employees, agents, representatives, contractors and subcontractors. The Applicant agrees to indemnify Arrow against any claim or demand for any such loss or damage.

L. The Applicant is responsible for all damages to Arrow’s Infrastructure when works have commenced prior to the Applicant obtaining Arrow’s Plans or failure to follow agreed instructions.

M. Arrow reserves all rights to recover compensation for loss or damage caused by interference or damage, including consequential loss and damages to its Infrastructure or other property.

N. Despite Arrow’s reasonable efforts to take care in the preparation of the Plans the Applicant agrees that:

a. Arrow does not make or give any representation, assurance or warranty, express or implied, that the Plans are or will be complete or accurate or free from any errors or omissions and the Applicant agrees that it must make its own assessment of the Plans;

b. The Applicant releases Arrow to the fullest extent permitted by law, from and against all claims, actions, damages, remedies and matters arising from or which may arise from or in connection with the provision of, or any purported reliance on, the Plans; and

c. Arrow is under no obligation to notify the Applicant or provide any further information to the Applicant if it becomes aware of any inaccuracy, incompleteness or change in the Plans, nor is it under any other obligation or duty in relation to the Plans.

WARNING TO RECIPIENT DUTY OF CARE: In response to your request, we wish to confirm that Arrow Energy Pty Ltd (on its own behalf and on behalf of its related bodies corporate) operates an underground pipeline and associated infrastructure (Infrastructure) at or in the vicinity of your query.

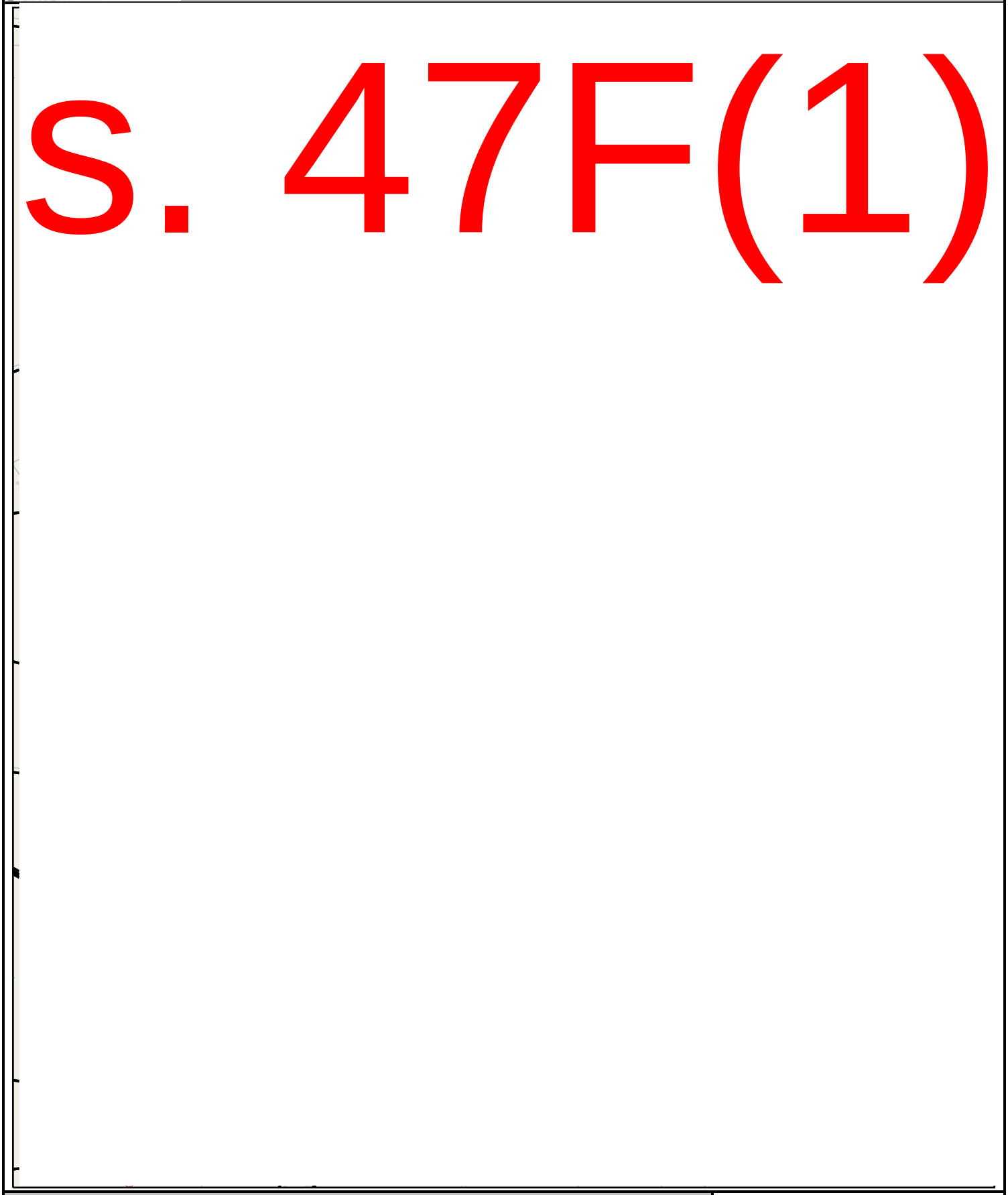
If your works are proposed to be carried out near the Infrastructure, please ensure compliance with the attached Duty of Care document which forms an integral part of any information supplied by Arrow (and which provision of the map or any other information is subject to).

arrow energy
go further

Sequence No: 200714600

s. 47F(1)

s. 47F(1)



Source: Arrow Energy Pty Ltd
Geosciences Australia
Dept. Envir and Resource Mgnt
Open Street Map

Arrow Energy Contact Information
P: (07) 3012 4000
E: info@arrowenergy.com.au

0 0.3km

GDA94

N

- Affected – Point
- Affected – Line
- Affected – Polygon
- Pipeline
- Roads
- Land Parcel
- Deviated Well Path
- Deviated Well Path - Depth

Well Sites
- Completed
- Drilling
- Monitoring
- On Production
- Plugged/Abandoned
- Suspended
- Unknown

Map 1

Sequence No: 200714600

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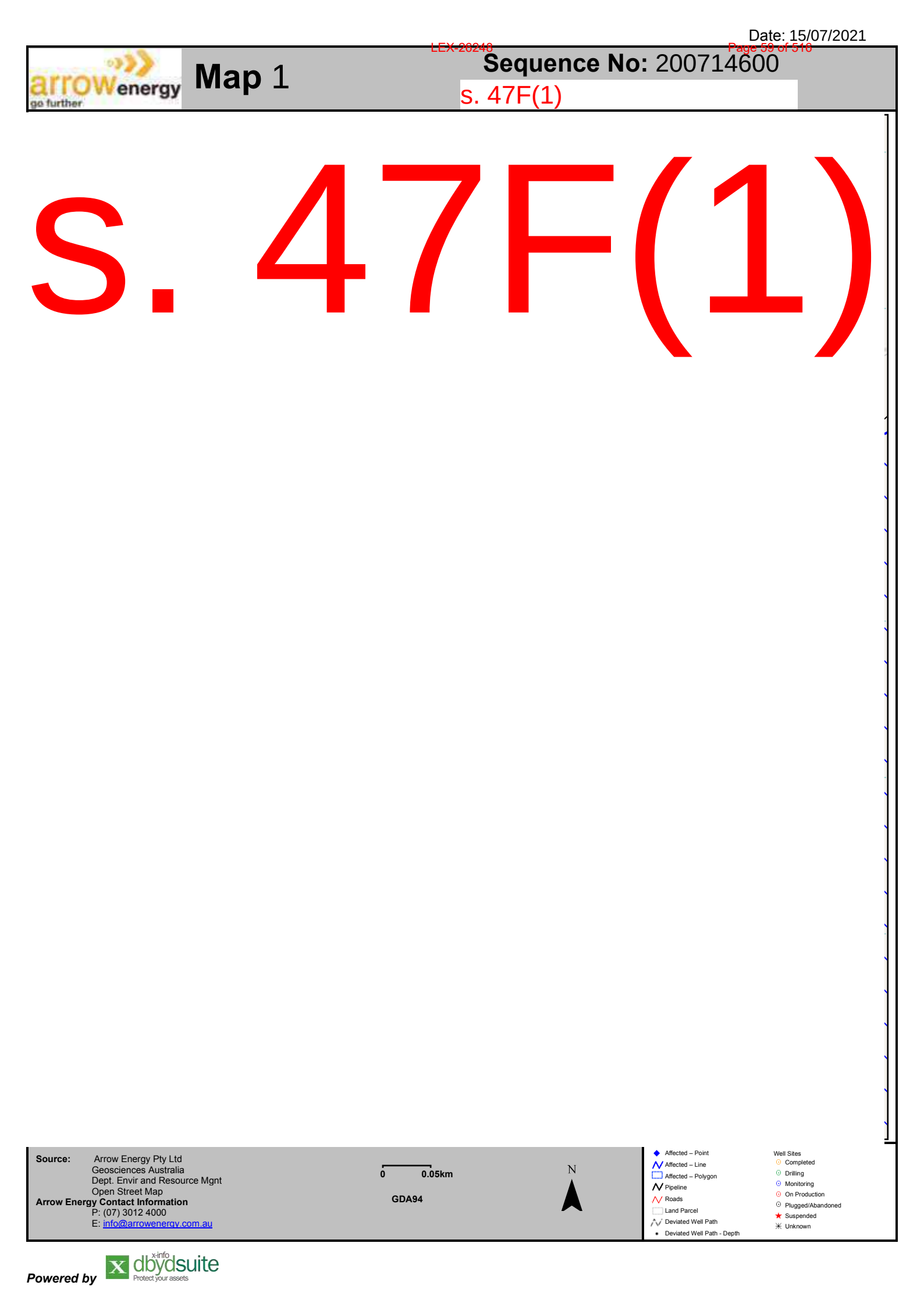
S. 47F(1)



Map 2

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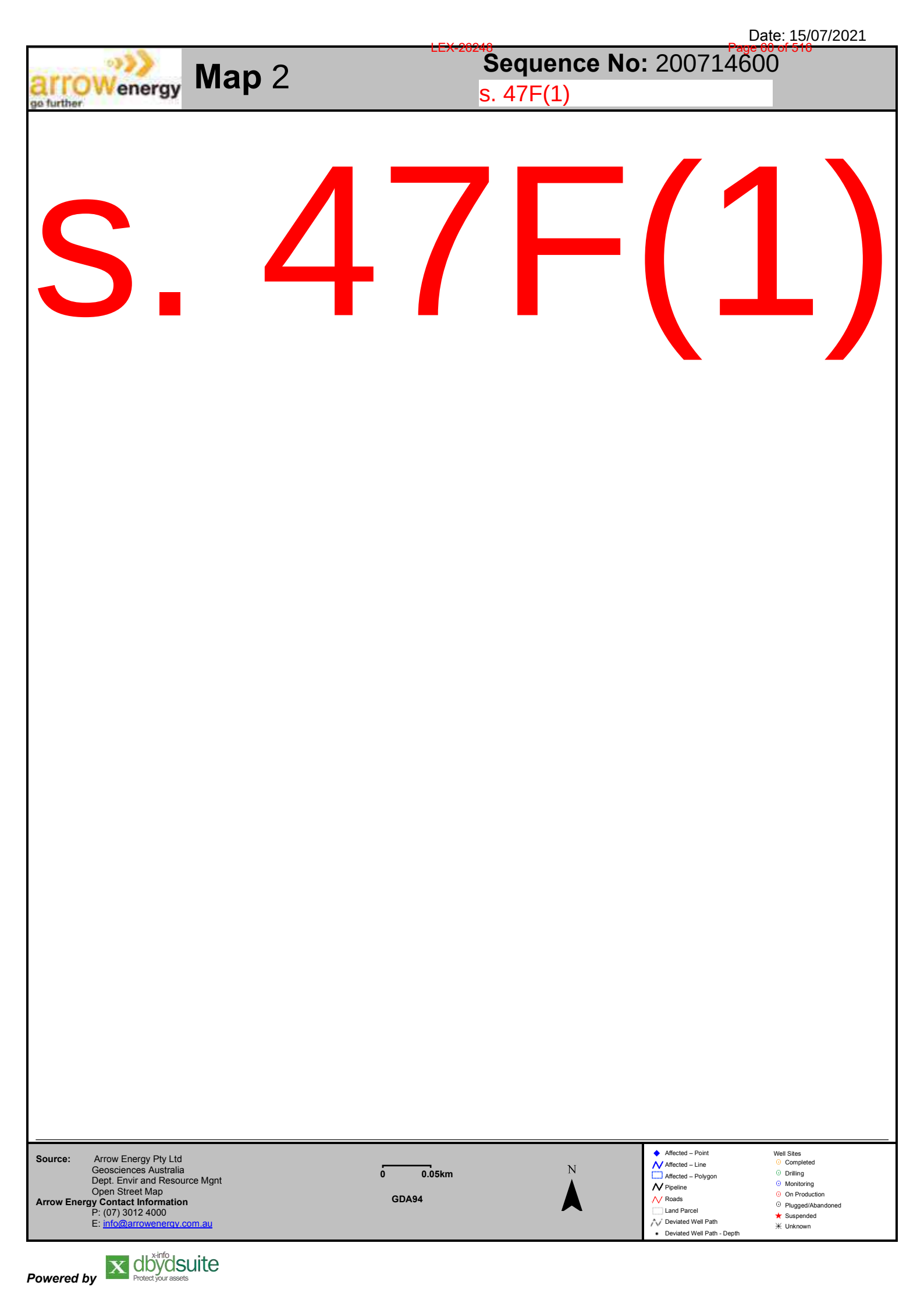
S. 47F(1)



Map 3

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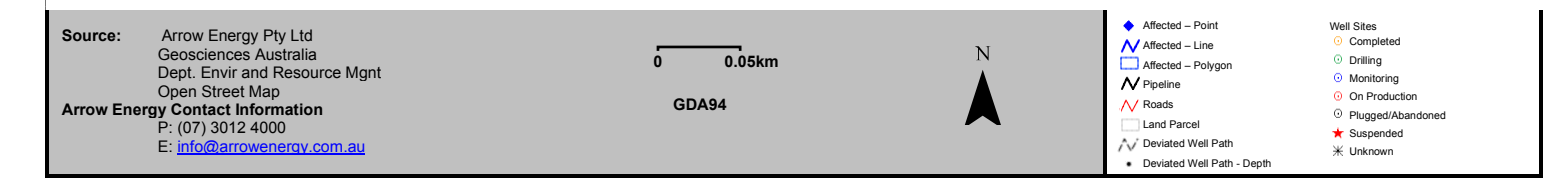

Map 4

Sequence No: 200714600

s. 47F(1)

S. 47F(1)

Source: Arrow Energy Pty Ltd
Geosciences Australia
Dept. Envir and Resource Mgnt
Open Street Map

Arrow Energy Contact Information
P: (07) 3012 4000
E: info@arrowenergy.com.au

0 0.05km

GDA94

N

- Affected – Point
- Affected – Line
- Affected – Polygon
- Pipeline
- Roads
- Land Parcel
- Deviated Well Path
- Deviated Well Path - Depth

Well Sites
- Completed
- Drilling
- Monitoring
- On Production
- Plugged/Abandoned
- Suspended
- Unknown

Map 5

Sequence No: 200714600

s. 47F(1)

S. 47F(1)

Source: Arrow Energy Pty Ltd
Geosciences Australia
Dept. Envir and Resource Mgnt
Open Street Map

Arrow Energy Contact Information
P: (07) 3012 4000
E: info@arrowenergy.com.au

- Affected – Point
- Affected – Line
- Affected – Polygon
- Pipeline
- Roads
- Land Parcel
- Deviated Well Path
- Deviated Well Path - Depth

Well Sites
- Completed
- Drilling
- Monitoring
- On Production
- Plugged/Abandoned
- Suspended
- Unknown

Map 6

Sequence No: 200714600

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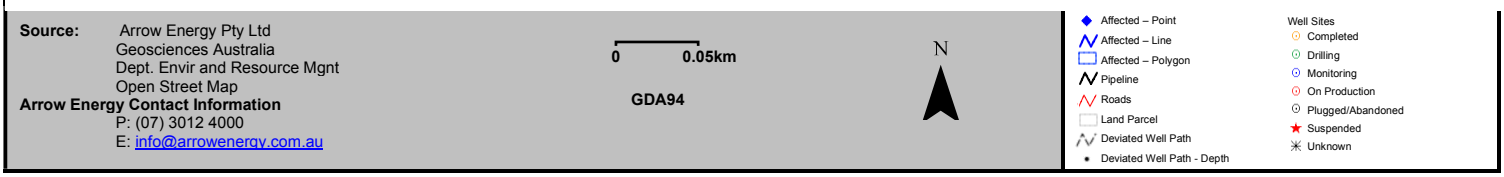

Map 7

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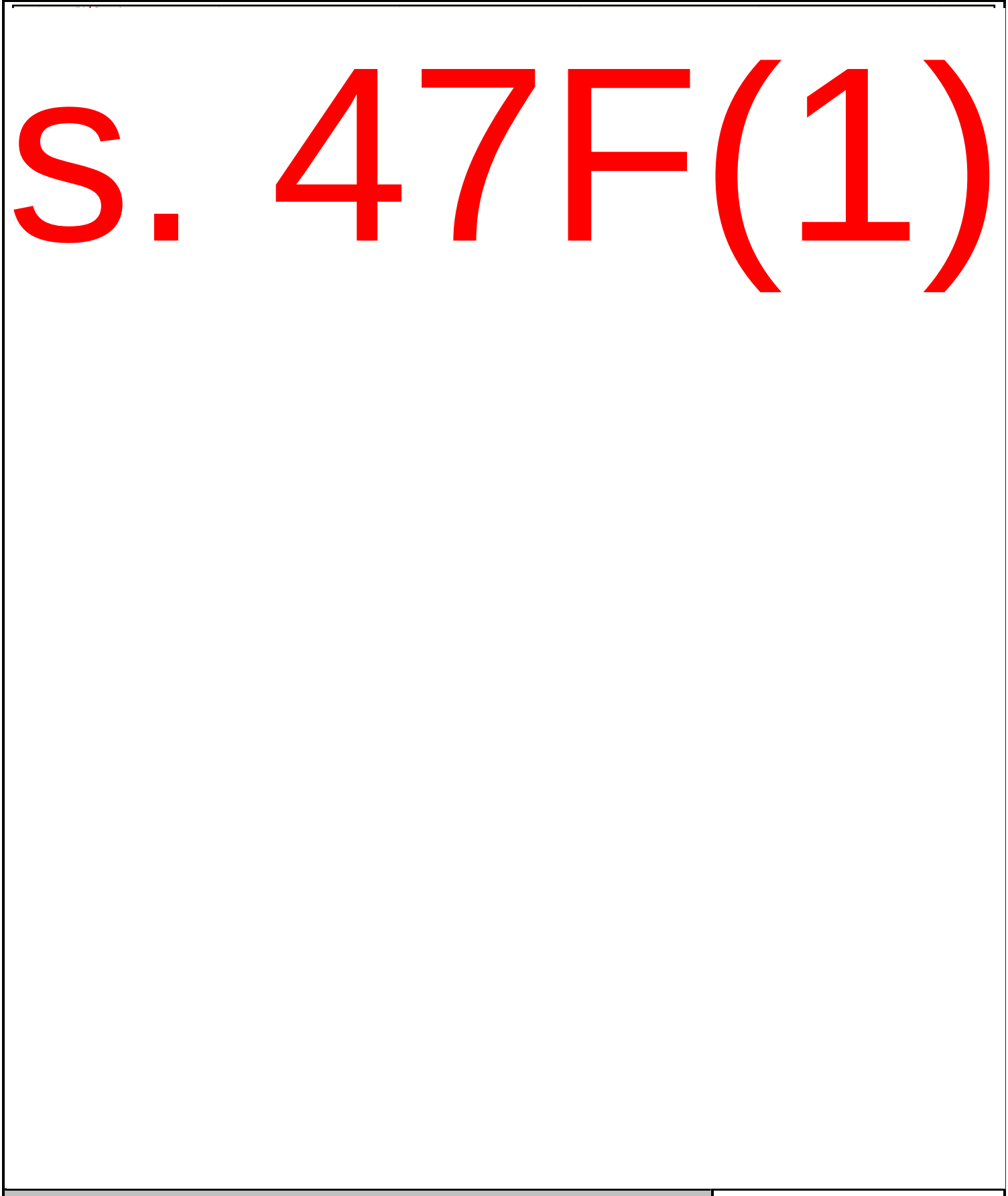
s. 47F(1)

S. 47F(1)



Source: Arrow Energy Pty Ltd
Geosciences Australia
Dept. Envir and Resource Mgnt
Open Street Map

Arrow Energy Contact Information
P: (07) 3012 4000
E: info@arrowenergy.com.au

0 0.05km

GDA94

N

- Affected – Point
- Affected – Line
- Affected – Polygon
- Pipeline
- Roads
- Land Parcel
- Deviated Well Path
- Deviated Well Path - Depth

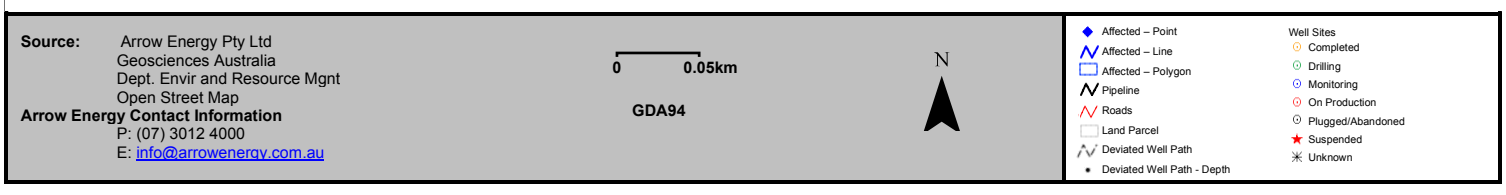
Well Sites
- Completed
- Drilling
- Monitoring
- On Production
- Plugged/Abandoned
- Suspended
- Unknown

Map 8

Sequence No: 200714600

s. 47F(1)

S. 47F(1)



s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Tuesday, 9 November 2021 3:02 PM
To: s. 22(1)(a)(ii)
Cc: EPBC Monitoring
Subject: RE: Min Corro - response to Max Winders [SEC=OFFICIAL]
Attachments: RE: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

No additions from me s. 22(1)(a)(ii)

We only have this previous request (attached) from s. 47F(1) to reconsider the decision, which was referred to PAS.

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Tuesday, 9 November 2021 2:38 PM
To: s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: Min Corro - response to Max Winders [SEC=OFFICIAL]
Importance: High

Hi s. 22(1)(a)(ii),

We are responding to correspondence received from Min Littleprouds office regarding concerns from Mr Max Winders (attached) around Arrow Energy operations in Qld.

I have attached the draft response, which notes passing this correspondence onto the IESC for consideration.

s. 22(1)(a)(ii) Are you comfortable with this response? Would you like to add anything to it?

s. 22(1)(a)(ii) ccing you at this stage for visibility given current Arrow issues. Let me know if there is anything pertinent to this corro that needs to be included.

A response at your earliest convenience would be greatly appreciated, so we can progress further clearances.

Thank you! 😊

s. 22(1)(a)(ii)

Director
Water Resources Regulatory Support, Environment Assessments (Vic Tas) and Post Approvals Branch Environment Approvals Division
Department of Agriculture, Water and the Environment

T: s. 22(1)(a)(ii) **E:** s. 22(1)(a)(ii) @environment.gov.au
PLEASE NOTE: I work Monday to Thursday

s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Thursday, 11 March 2021 10:07 AM
To: s. 22(1)(a)(ii)
Cc: s. 22(1)(a)(ii)@awe.gov.au
Subject: RE: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

I think this is an issue for PAS. It sounds like a request for a re-consideration.

I shall forward onto s. 22(1)(a)(ii) for PAS action.

Thanks
s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Wednesday, 10 March 2021 4:46 PM
To: s. 22(1)(a)(ii) @environment.gov.au>
Cc: s. 22(1)(a)(ii)@awe.gov.au
Subject: FW: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Can you please action this request in s. 22(1)(a)(ii) absence?

From: s. 22(1)(a)(ii)
Sent: Tuesday, 9 March 2021 1:25 PM
To: s. 22(1)(a)(ii) @environment.gov.au>
Cc: s. 22(1)(a)(ii) @awe.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: FW: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

Tash has send through an email to me from s. 47F(1) in s. 47F(1) Can you please review the email to see if this one for EAS for response?

Summary below.

Allegations relating to:

1. The groundwater supply to cattle feedlot at s. 47F(1) is impacted upon by the extraction of CSG from Arrow Energy's PL194 (Kogan North) and PL230 (Daandine) gas fields– as well as the extraction of CSG water from QGC's David gas field PL273.
2. Groundwater impact assessments carried out by OGIA may not recognise the real impact of drilling overly deep gas wells and so adversely impacting upon the Hutton Sandstones regional aquifer.
3. A new proposal by Arrow to divert water from the RO plant at Daandine and associated activity would be contrary to QLD *Coal Seam Gas Water Management Policy 2012*.

Requests:

1. To explain OGIA modelling and deep gas well drilling impacts to IESC.
2. That Arrow conduct a new EIS process with draft Terms of Reference, public comments on the draft, formal public consultation, release of the draft for public comment and then consideration of the draft by the IESC and the relevant Queensland Government.

s. 47F(1) and s. 47F(1) own Wambo Cattle Company and, since 2005 have operated the 13,000 SCU
s. 47F(1) .
s. 47F(1) is also the principle at MWA Environmental Consultants
Level 15/241 Adelaide St, Brisbane QLD 4000
GPO Box 3137, Brisbane Qld 4001
(07) 3002 5500
mail@mwaenviro.com.au
ABN: 94 010 833 084
http://www.mwaenviro.com.au/people.html

News items:
https://www.beefcentral.com/news/feedlot-operator-takes-gas-company-to-court-over-groundwater-access/
https://www.abc.net.au/news/2020-03-13/farmer-report-says-coal-seam-gas-company-provided-incorrect-data/12045292
https://www.beefcentral.com/features/top-25/lot-feeders/top-25-no-18-wambo-cattle-co-qld/

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Tuesday, 9 March 2021 11:45 AM
To: s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; CIU Mail <ciu@environment.gov.au>s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: FW: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii) as discussed correspondence below from s. 47F(1) regarding Arrow's project. It is likely to come through in PDMS at some point as Min Littleproud has been Cc'd.

FYI s. 22(1)(a)(ii) it notes previous and potential future engagement with the IESC.

Thanks
s. 22(1)(a)(ii)

s. 22(1)(a)(ii)
Director (A/g)
Water Resources Regulatory Support, Environment Approvals Division
Department of Agriculture, Water and the Environment

Ts. 22(1)(a)(ii) | E: s. 22(1)(a)(ii) @environment.gov.au
PLEASE NOTE: I work Monday to Thursday

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Tuesday, 9 March 2021 9:07 AM
To: CIU Mail <ciu@environment.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: RE: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Thanks CIU

Anything on CSG and ground water – is a pretty safe bet its s. 22(1)(a)(ii) team…. (Phew and sorry s. 22(1)(a)(ii))

Cheers
s. 22(1)(a)(ii)

From: CIU Mail <ciu@environment.gov.au>
Sent: Tuesday, 9 March 2021 8:49 AM
To: s. 22(1)(a)(ii) @environment.gov.au>
Subject: FW: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

Good morning s. 22(1)(a)(ii)

Please see email.

Would this enquiry sit within your team?

If not, would you know where it might sit?

Kind regards,

s. 22(1)(a)(ii)
Import Support Officer | Client Contact Group - Canberra | Assessment and Client Contact Branch | Biosecurity Operations Division
Phone: s. 22(1)(a)(ii)

From: Media <media@environment.gov.au>
Sent: Wednesday, 3 March 2021 1:14 PM
To: CIU Mail <ciu@environment.gov.au>
Subject: FW: Expansion of Arrow Energy CSG Project - Surat Basin [SEC=OFFICIAL]

From: s. 47F(1) @wambofeedlot.com.au>
Sent: Tuesday, 2 March 2021 5:48 PM
To: Media <media@environment.gov.au>
Cc: "David Littleproud MP, Federal Member for Maranoa" <david.littleproud.mp@aph.gov.au>
Subject: Expansion of Arrow Energy CSG Project - Surat Basin

Good afternoon

The groundwater supply to my company's cattle feedlot at s. 47F(1) is impacted upon by the extraction of CSG from Arrow Energy's PL194 (Kogan North) and PL230 (Daandine) gas fields– as well as the extraction of CSG water from QGC's David gas field PL273. This has been going on since 2004 and I have been modelling and monitoring the groundwater impacts with some success. I have also been studying well completion reports that, by law, were able to be kept confidential for five years and I doubt that anyone in government considered them in the detail they required.

I understand that there is a new proposal by Arrow to divert water from the existing RO plant at Daandine to a new water treatment facility at Theten (probably because the brine ponds are full) and that, ultimately, the treated water from either or both plants will be delivered to other landholders in locations which would be quite distant from where the CSG water is extracted and this is completely contrary to the priorities listed in the Queensland Government's *Coal Seam Gas Water Management Policy 2012*.

I further understand that this may be an initial stage of a long-mooted proposal by Arrow Energy (Shell/Petrochina) to link with Shell's QGC to deliver gas from Arrow's eastern Surat Basin gas fields to QGC's LNG export facilities in Gladstone.

If this is the case there is nothing in this proposal for the regional or state or federal economy and falls far short of what was proposed when Arrow Energy first put out its draft Surat Gladstone Project EIS in 2011 and its then CSG

water management plans were approved by both levels of government in late 2013 before Royal Dutch Shell announced that it was pulling out of the project.

Since then we have further information showing that the groundwater impact assessments carried out by OGIA may not recognise the real impact of drilling overly deep gas wells and so adversely impacting upon the Hutton Sandstones regional aquifer and that recognition of this issue has been avoided by the structure of the inappropriate MODFLOW-DRAINS modelling by the OGIA in 2016 and again in 2019. I would like the opportunity to explain this in detail to someone from the IESC as a matter of urgency.

This problem has also been detected by depressurisation of the Springbok aquifer above the Walloons

As with depressurisation and gasification of the aquifers by poorly managed drilling and completiong of gas wells (particularly in QGC's David gas field) there are real legacy issues to be recognised by government as they are not recognised by gas companies and when they relinguish their leases, there will be no funds to rectify the matters.

I know that many of the farmers in the Condamine Alluvials who supply our feedlot with grain and silage are concerned about land subsidence caused by depressurisation of the ground below their farms and ring tanks – particularly around multiple well sites. I have read the Coffey report prepared for Arrow and its content concerns me that the legacy issues involved with this may not be addressed by your government's conditions.

There is also the issue of fugitive emissions from CSG water when released from the gathering lines into ponds. This is something that needs to be considered as part of the design of any water treatment plant if this industry is considered to be less carbon efficient than long-wall coal mining.

I strongly commend to your department that the Proponent(s) be required to initiate a new formal EIS process with draft Terms of Reference, public comments on the draft, preparation of a draft EIS including formal public consultation, release of the draft for public comment and then consideration of the draft by the IESC and the relevant Queensland Government.

Anything less would be a mere charade.

I would be grateful if you would bring this to the attention of the Hon. David Littleproud and the Hon. Susan Ley.

I would be prepared to fly to Canberra to explain my concerns if this would assist in highlighting the need for your department to take a stronger stand on this issue.

I have previously made submissions to a Senate Inquiry and to the former chair of the IESC (Dr Johnson) and, by telephone due to COVID, to Dr Peter Baker of the IESC.

My principal office is in Brisbane and I live in Mr Trevor Evans' electorate of Brisbane. Perhaps a meeting with Mr Evans might assist in expediting the matter. He should be made aware of the unresolved and continuing waste brine issue.

My telephone contact is s. 47F(1)

Yours sincerely

s. 47F(1)

s. 22(1)(a)(ii)

From: EPBC Monitoring
Sent: Wednesday, 11 August 2021 3:32 PM
To: s. 22(1)(a)(ii) EPBC Monitoring
Cc: s. 22(1)(a)(ii)
Subject: RE: Attachment: Revocation request: EPBC 2010/5343 and EPBC 2010/5344 [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

I can provide the following advice regarding the two Arrow Energy projects in the Surat Basin, Queensland.

EPBC 2010/5343 – Dalby Expansion Project
The department receives regular status updates as to the activities undertaken by Arrow Energy in relation to this project.
To date, all activities have been undertaken in accordance with the Particular Manners specified in the decision.
The approval EPBC 2010/5344 overlaps the entirety of the footprint specified for the decision EPBC 2010/5343.

EPBC 2010/5344 – Surat Gas Expansion Project
Since the project was approved, the department conducted several enquires following allegations of non-compliance with conditions attached to the approval.
The enquires did not identify non-compliance with the conditions of approval, and no compliance action has been taken.
As a result of allegations received in 2021, officers from the department conducted an inspection of the EPBC approval footprint during May 2021. Enquires are ongoing.

Additional compliance information

The Environmental Audit Section is responsible for enforcing the conditions of controlled action approval decisions made under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The section has an active monitoring and audit program which involves site inspections, routine audits and compliance investigations.

All allegations of non-compliance are investigated, and the Department takes non-compliance with conditions of approval seriously.

Could you please cc in Richard Chadwick into any decisions progressed to Kim?

Happy to answer any questions or clarify any points.

Cheers,

s. 22(1)(a)(ii)
Compliance Officer
Environmental Audit Section
Compliance & Enforcement Division
Department of Agriculture, Water and the Environment
GPO Box 858, Canberra, ACT 2601
T: s. 22(1)(a)(ii)
E: s. 22(1)(a)(ii) @environment.gov.au

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Tuesday, 10 August 2021 5:47 PM
To: EPBC Monitoring <EPBCMonitoring@environment.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>
Subject: Attachment: Revocation request: EPBC 2010/5343 and EPBC 2010/5344 [SEC=OFFICIAL]

Apologies, I forgot to add the attachment in my previous e-mail.

From: s. 22(1)(a)(ii)
Sent: Tuesday, 10 August 2021 4:25 PM
To: EPBC Monitoring <EPBCMonitoring@environment.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii)
@environment.gov.au>
Subject: Revocation request: EPBC 2010/5343 and EPBC 2010/5344 [SEC=OFFICIAL]

Hello Compliance Team,

A revocation request has been made under Section 145(1) and Section 489 of the EPBC Act for two Arrow Energy projects located in the Surat Basin, Queensland. The request has been made by s. 47F(1) (correspondence attached). The projects in question are the:

Dalby Expansion project - EPBC 2010/5343 (NCA PM); and
Surat Gas Expansion Project - EPBC 2010/5344 (CA).

Could please advise us of the compliance history for both projects and if there are any contraventions we need to be aware of.
Your assistance is much appreciated.

Kind Regards,
s. 22(1)(a)(ii)

s. 22(1)(a)(ii)
Project Officer | Water Resources Regulatory Support
Environment Approvals Division
Department of Agriculture, Water and the Environment
E: s. 22(1)(a)(ii) | P: s. 22(1)(a)(ii)

s. 22(1)(a)(ii)

From: s. 47F(1) @des.qld.gov.au>
Sent: Thursday, 28 October 2021 11:20 AM
To: EPBC Monitoring
Cc: s. 47F(1)
Subject: Enquiry: EPBC 2010/5343
Attachments: EPBC Referral Decision 2010-5343 Dalby Expansion Project.pdf

Importance: High

Categories: s. 22(1)(a)(ii)

Good Morning,

The Energy and Extractive Resources Team from the Queensland Department of Environment and Science recently received a 'Notice of Election' application for Offsets required under Environmental Authority (EA) EPPG00972513 held by Arrow Energy Pty Ltd . Through discussions with one of your officers in the Post Approvals space, it was identified that we should contact the EPBC Monitoring team, as there are outstanding concerns regarding the approval pathway for this disturbance and potential issues arising from the proposed disturbance.

Specifically, I am enquiring about EPBC Referral Decision 2010/5343 for Arrow Energy Pty Ltd (attached to this email), this Decision relates to the Dalby Expansion Project (DXP). The EPBC Referral Decision 2010/5343 determined that the DXP is '*not a controlled action provided it is undertaken in the manner set out in this decision'*. It is noted that there is an existing EPBC Referral Decision 2010/5344 for Arrow's Surat Gas Project (SGP) that also covers the area included in the DXP approval.

We would like to receive guidance from someone within DAWE regarding the process around significant impacts to MNES values (that are also listed MSES values) for the DXP under EPBC Referral Decision 2010/5343.

Currently Arrow are seeking approval to offset impacts from Stage 1f of the DXP; Stages 1a-1e have already been approved by DES and the disturbance has been undertaken as per the conditions of their EA. The disturbance activities associated with Stages 1a-1e have potentially resulted in significant impacts to MNES values. We are required to make a Decision regarding the Notice of Election by 24 November 2021. As such we would like to resolve this issue as quickly as possible to enable us to make an appropriate decision regarding this application.

This particular concern may relate to several other projects that Arrow Energy Pty Ltd are undertaking within Queensland – if possible we would appreciate the ability to schedule a meeting to discuss the above query.

If you have any concerns or questions regarding the above please do not hesitate to contact me.

Thank-you for taking the time to review my enquiry.

Kind Regards,

s. 47F(1)
Environmental Officer
Energy, Extractive and Southwest Assessment I Environmental Services & Regulation
Department of Environment and Science

P 07 3330 5605
GPO Box, 2454, Brisbane, QLD 4000

Queensland Government

Notification of REFERRAL DECISION – not controlled action if undertaken in a particular manner

Dalby Expansion Project (EPBC 2010/5343)

This decision is made under sections 75 and 77A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Arrow Energy ACN: 078521936
proposed action	To increase the production capacity of the Surat Basin operations through the initial development of gas fields and expansion of existing gas fields near Dalby, Queensland and as described in the referral received under the EPBC Act on 2 February 2010.

Referral decision: Not a controlled action if undertaken in a particular manner

status of proposed action	The proposed action is not a controlled action provided it is undertaken in the manner set out in this decision.

Person authorised to make decision

name and position	Mary Colreavy Assistant Secretary Environment Assessment Branch
signature	s. 47F(1)
date of decision	16 April 2010

manner in which proposed action must be taken

The following measures must be taken to avoid significant impacts on listed threatened species and communities (sections 18 & 18A).

- Prior to any vegetation disturbance, pre-clearance surveys must be conducted in areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are present, likely to occur or have the potential to occur.

  These pre-clearance surveys must be undertaken by a suitably qualified person. If the surveys cannot be conducted at optimum times for the relevant EPBC-listed species, their presence should be assumed and avoidance and minimisation measures implemented.

  A record of the survey and results must be kept and submitted to the Department on request.

(continued next page)

- In areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are likely to be impacted by the proposed action, the person taking the action must implement avoidance measures so as to have no significant impact on those species or communities.

  Demonstration of the avoidance measures undertaken must be provided to the Department on request.

- In areas where impacts to EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species cannot be avoided, the person taking the action must minimise potential impacts by implementing Arrow Energy's Environmental Management Standard Operating Procedures as provided in the referral submitted on 2 February 2010, or subsequent versions that incorporate but do not reduce or remove the environmental management procedures set out in that version of the documents, for: vegetation and habitat; site disturbance; ground disturbance and erosion; weed and pathogen; and rehabilitation.

  Demonstration of minimisation measures must be provided to the Department on request.

THE HON SUSSAN LEY MP
MINISTER FOR THE ENVIRONMENT
MEMBER FOR FARRER

MC20-011831

The Hon David Littleproud MP
Minister for Agriculture, Drought and Emergency Management
Member for Maranoa
PO Box 641
DALBY QLD 4405

01 SEP 2020

Dear Minister David

Thank you for your representation of 3 August 2020 on behalf of your constituent S. 47F(1) of Pirrinuan concerning coal seam gas (CSG) operations undertaken by Arrow Energy near Dalby.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage matters of national environmental significance, including water resources in relation to coal seam gas and large coal mining development (the Water Trigger). Under the EPBC Act, actions that have, or are likely to have, a significant impact on water resources require approval from me as the Australian Government Minister for the Environment, or my delegate. Prior to an approval being granted, the environmental impacts of actions are assessed. Approved actions may be subject to conditions to ensure unacceptable impacts do not occur.

The Department has advised me that Ms Ronnfeldt is referring to two CSG operations, both of which, have been referred under the EPBC Act. These operations are the Dalby Expansion Project (EPBC 2010/5343) and the Surat Gas Expansion Project (EPBC 2010/5344). The Dalby Expansion Project was deemed not a controlled action if undertaken in a particular manner on 16 April 2010. This decision pre-dates the introduction of the Water Trigger.

The Surat Gas Expansion Project was assessed and approved on 19 December 2013, under the EPBC Act, by the then Minister for the Environment, the Hon Greg Hunt MP. The approval is subject to strict environmental conditions to protect and manage matters of national environmental significance, including water resources. This includes a requirement that the approval holder implement their Water Monitoring and Management Plan (WMMP), which was updated and approved on 11 November 2019.

Section 78 of the EPBC Act provides for the reconsideration of referral decisions that have not been approved. This application could only apply to the Dalby Expansion Project (EPBC 2010/5343), which the WMMP does not relate to. Section 142 of the EPBC Act requires an approval holder to comply with conditions attached to an approval. Penalties may apply to approval holders who contravene conditions. The Department of Agriculture, Water and the Environment has an active monitoring program that includes inspections and audits to monitor compliance with conditions of approval under the Act.

All compliance activities are conducted in accordance with the Department's published compliance policy, which outlines how the Department responds to allegations of non-compliance. The compliance policy is available on the Department's website at environment.gov.au/about-us/publications/compliance-policy. The information provided by Ms Ronnfeldt will be helpful in assisting Departmental officers with their enquiries. Impacts on agriculture are not a matter of national environmental significance considered under the EPBC Act.

Thank you for bringing s. 47F(1) concerns to my attention.

Yours sincerely

SUSSAN LEY

s. 22(1)(a)(ii)

From: s. 11C(1)(a)
Sent: Thursday, 3 March 2022 11:51 AM
To: EPBC Monitoring
Subject: 2010/5343
Attachments: EPBC.pdf; EPBC 2010-5343 well development area Lot Plans.pdf; 02 _Sprinvale_WYSALL.jpg

Good morning,

I have concerns regarding the referral number EPBC 2010/5343 - no one seems to be able to answer our question as there exists differing responses from the resource company itself, Arrow Energy, and the statutory body that is supposed to oversee this process in Queensland, Gasfields Commission.

I am attaching a letter with my concerns and questions.

I have attached further material to support this letter.

I have tried to be clear and concise given this subject is complicated.

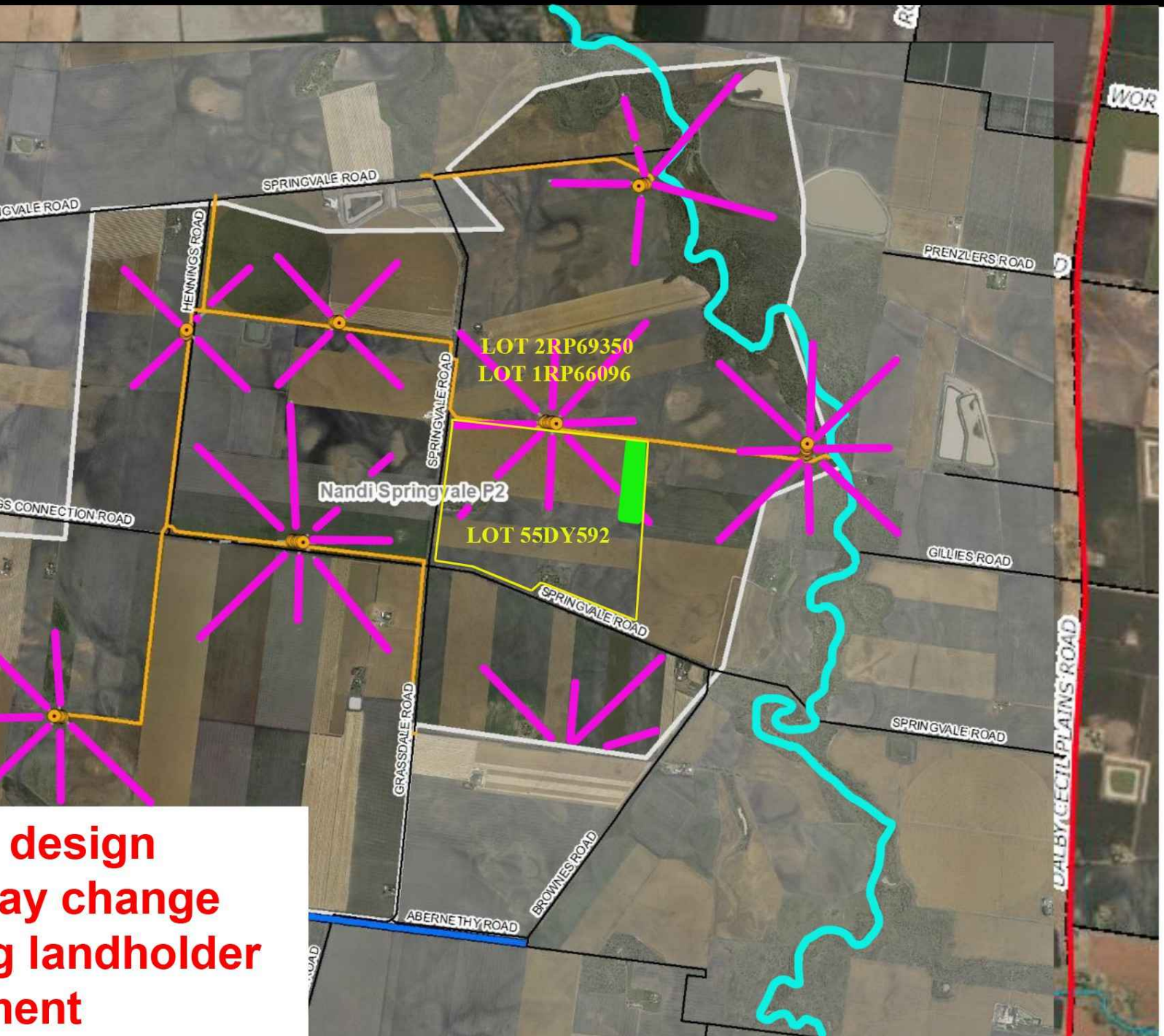
This matter is urgent. We are at our wits end. I've tried for a year now to try and get answers.

Regards,

s. 11C(1)(a)

nstruction in Springvale area

arro
go further



design
ay change
g landholder
nent

Wells & gathering

- Approximately 44 wells ov multi-well pads
- Approximately 19km of wa gas gathering pipelines

Workforce

- Construction crews to stay existing accommodation fa Dalby
- short-term (mobile) drilling Tipton CGPF

Turnouts

- Locations to be determine Springvale Road and Henr Road (pending approvals)

Water

- Construction water source Tipton Dam or offtake at P Pilot on Abernathy Road

Gravel

- Gravel to be sourced from quarry on private property

To whom it may concern,

This letter concerns the EPBC Act, and whether the attached Area Wide Plans by Arrow Energy come under the Dalby Expansion Project 2010/5343 (not a controlled activity, therefore a referral was not requested under the EPBC Act) or the Surat Gas Project 2010/5344 (a controlled activity, therefore a referral was requested under the EPBC Act).

Last year I wrote to Queensland GasFields Commission (2nd Dec 2021) and Arrow Energy (28th Oct 2021) specifically asking each as to whether the Arrow Energy Area Wide Plans for Springvale and Grassdale (attached), come under the Dalby Expansion Project 2010/5343 or the Surat Gas Project 2010/5344. This information is necessary to determine whether or not farmers are protected by the CSG Updated Water Management & Monitoring Plan?

Queensland GasFields Commission informed me of the following: *"In relation to subsidence conditions associated with EPBC Act approvals, the Commission understands that the Springvale and Grassdale areas are covered by the EBPC Act conditions associated with the SGP and subject to Arrow's Water Monitoring and Management Plan (WMMP). This means that all of the Springvale and Grassdale area would be included in the monitoring and reporting requirements and associated protections afforded under the WMMP."*

Arrow Energy provided an alternative response; *"Finally, your question (dated 31 October 2021) regarding ground water matters within the Springvale and Grassdale areas are considered under the Dalby Expansion Area and the Underground Water Impact Report prepared by the Office of Groundwater Impact Assessment in accordance with Chapter 3 of the Water Act. Subsidence matters for these areas are considered under the Surat Gas Project EBPC Approval."*

Gasfields Commission and Arrow Energy, have provided inadequate explanations and arguably misleading and confusing answers to farmers in Springvale and Grassdale, Queensland.

According to the map entitled Project Area Location and Facilities (in the attached document *EPBC 2010/5343 well development lot plan*) parts of Springvale and Grassdale come under the Project Area Location that is to exist in the Dalby Expansion Plan whereas other parts do not. I've highlighted our farm, Wysall Lot 55DY592, in red in the map entitled Project Area Location and Facilities (in the attached document *EPBC 2010/5343 well development lot plan)* to provide an understanding of locations.

The attached *EPBC 2010/5343 well development lot plan* states Arrow Energy can construct, I would assume, a maximum of 50 production wells in PL238 under the Dalby Expansion Area. In PL198, as I understand it, Arrow Energy is allowed a maximum of 150 production wells under the Dalby Expansion Project.

I asked s. 11C(1)(a) from Qld DRNME (Resources) how many CSG Wells are in operation on PL198 and PL238. He responded with the following;

Response 25th May 2021;

The specific question being asked is; *To date, in total, how many CSG wells are in operation (on PL198)*. Summary of findings:

- The Dalby Expansion Project had existing activities being conducted on the relevant tenures prior to the approval of the Surat Gas Project EIS;

- There were:

o 140 wells existing;

o 25 new wells proposed;

o A total of 165 wells approved on PL198 prior to the SGP EIS approval.

• The current DXP EA doesn't authorise the specific number of wells per tenure, however, the most recent application material that resulted in the increase of wells notes the following (from 2019):

o 20 appraisal wells existing (18 P&A, 2 suspended);

o 166 development wells existing (143 production, 14 P&A, 9 suspended);

o 3 exploration existing (2 P&A, 1 suspended);

o 223 new wells proposed on PL198.

- Given the above that equals up to 412 wells authorised on PL198, noting the above in that the DXP EA doesn't explicitly list the separation of amounts per tenure and only lists the total amount of 1,566 wells.

- In line with the information provided below and previously, I am unable to confirm the numbers of how many wells are in operation on PL 198.

Response 14th July 2021;

The most recent major amendment shows the following for PL238, noting again that the DXP EA does not explicitly list the separation of amounts per tenure and only lists the total amount of 1,566 wells.

- 5 appraisal wells existing (5 suspended);

- 2 development wells existing (2 production);

- 5 exploration existing (5 plugged and abandoned);

- 193 new wells proposed on PL238.

Question One: First of all, what is going on? Initially *EPBC 2010/5343 well development lot plan showed* PL198 had approval for 150 production wells under the Dalby Expansion Project and PL238 had approval for 50 production wells under the Dalby Expansion Project. However, according to Qld DRNME (Resources), those numbers have significantly changed based on application material.

- What happened to increase the number of wells per Petroleum Lease 198 and 238?
- What/which authority gave approval for this change? State or Federal approval?
- Under what legislation?

Question Two: Why doesn't the Dalby Expansion Project Environmental Authority (under the authority of Qld Department of Environment) reflect what was initially submitted under the EPBC 2010/5343? John states; *"The current DXP EA doesn't authorise the specific number of wells per tenure"* in the DXP.

- Why doesn't the Qld Environmental Authority incorporate so many production wells per Petroleum Lease?
- Why hasn't the federal government ensured production wells per Petroleum Lease to be detailed in the Qld Environmental Authority?

Question Three: In regards to the Area Wide Plans provided by Arrow Energy (attached);

- Is the Dalby Expansion Project, specifically production wells, beholden to the Map entitled Project Area Location and Facilities in document *EPBC 2010/5343 well development lot plan?* In other words can production wells be placed only in areas highlighted in the Map entitled Project Area Location and Facilities?

- Is *Wysall Park* Lot 55DY592 outside the Project Area Location and Facilities for the Dalby Expansion Project as identified in Map entitled Project Area Location and Facilities in document *EPBC 2010/5343 well development lot plan?* In other words does this mean that Arrow Energy cannot place production wells on our property under Dalby Expansion Project?

Question Four: Furthermore, no one seems to be able to clearly answer the following question, which I've asked numerous times in the past two years.

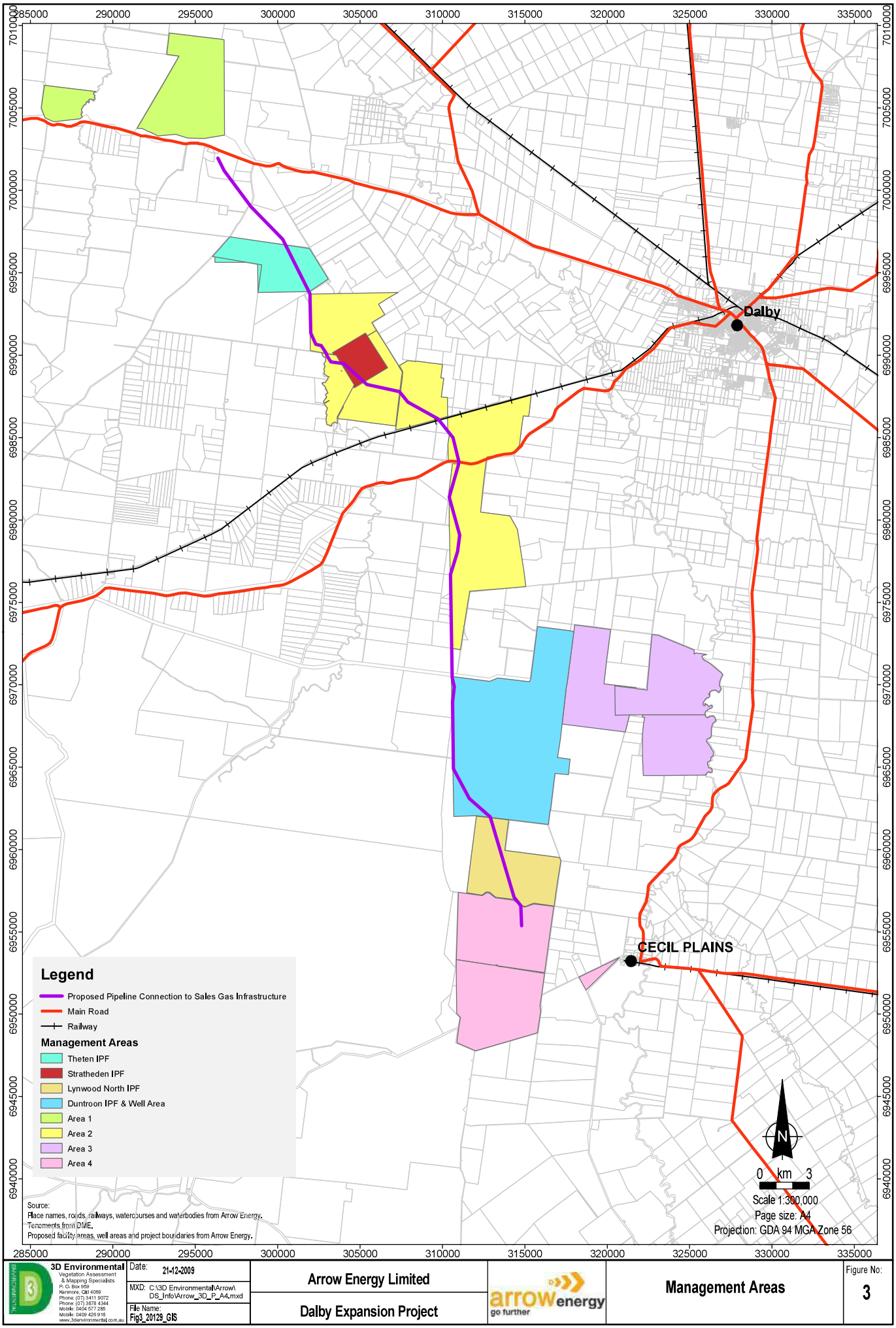
- To date, how many production wells (including those that have stopped production or have been suspended from production) are in operation in PL198 and PL238 under the Dalby Expansion Project 2010/5343?

Dalby Expansion Project did not need approval under the EPBC Act, given it was not a controlled activity. However, this decision was made by the Federal Minister of Env at the time, based on the maps submitted by Arrow Energy to the Federal Govt. Anything beyond these maps, petroleum leases and well figures, should technically be abided by - I would assume. No?

I need concise answers as you can imagine. None of this engenders confidence in the process. This is an urgent matter. Springvale is still without CSG wells, however this will change in a few months. We need answers immediately. This process is unacceptable. It is taking months and months to get at the facts and we are still in the dark and we are losing time.

Regards,

s. 11C(1)(a)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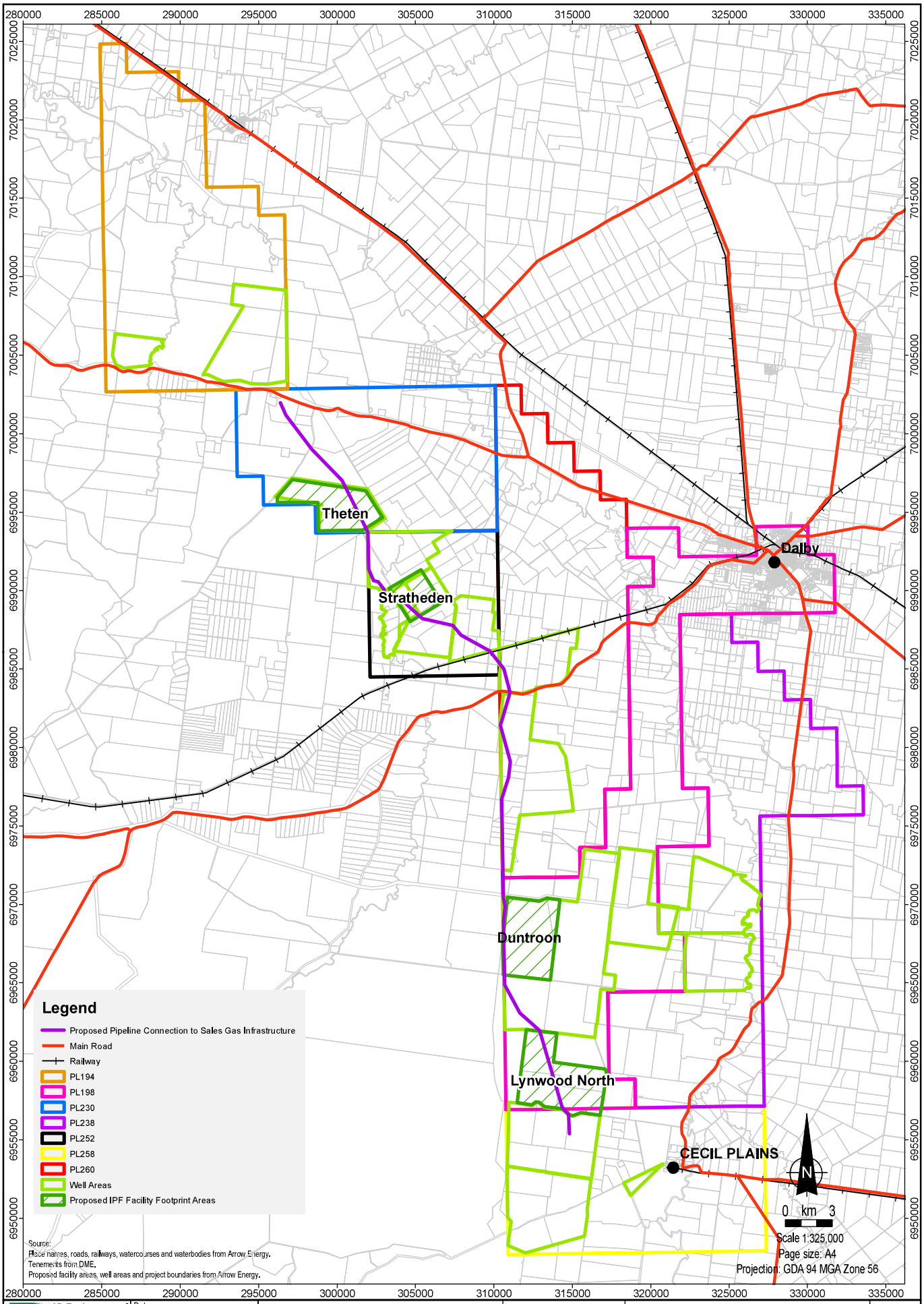
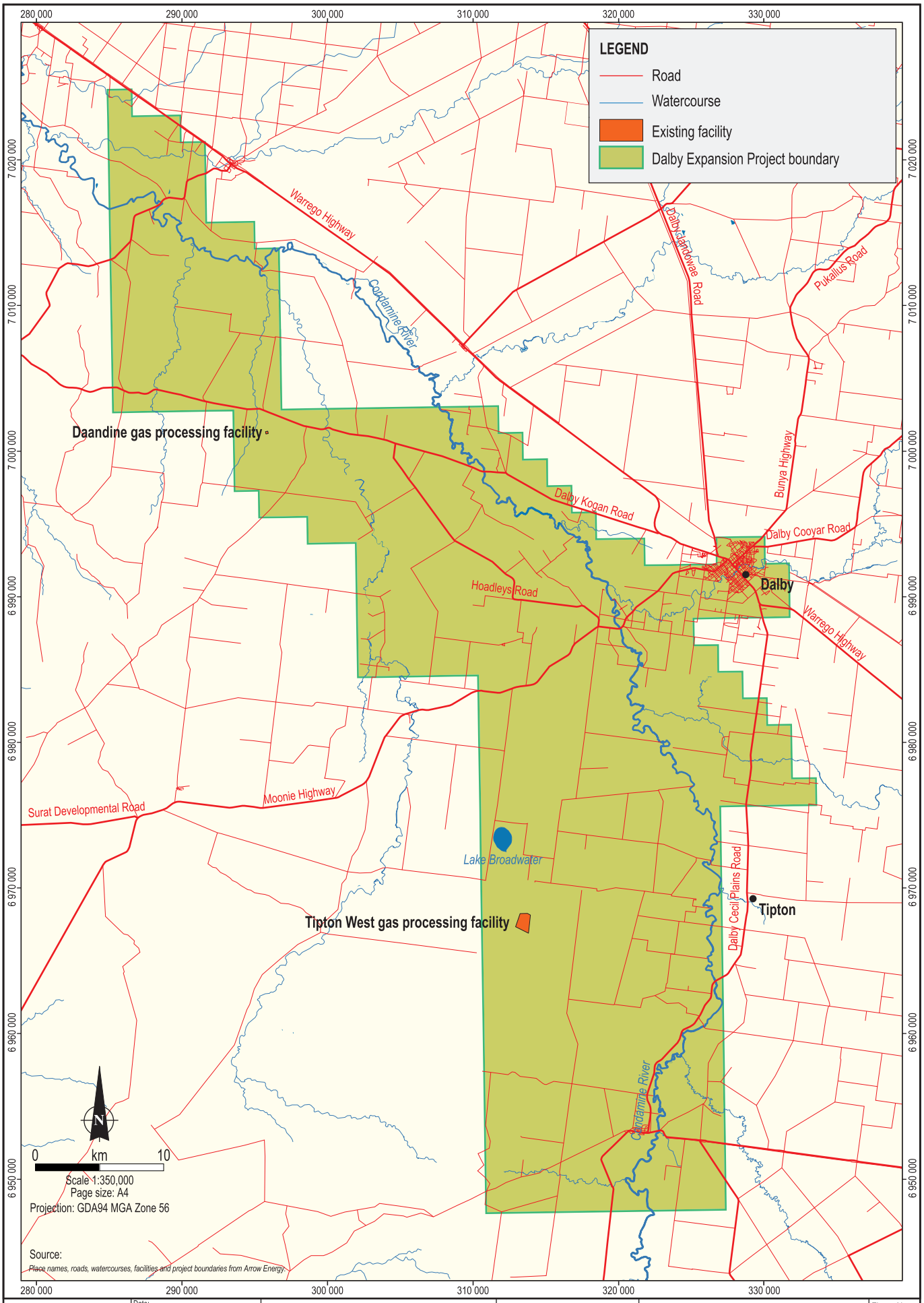
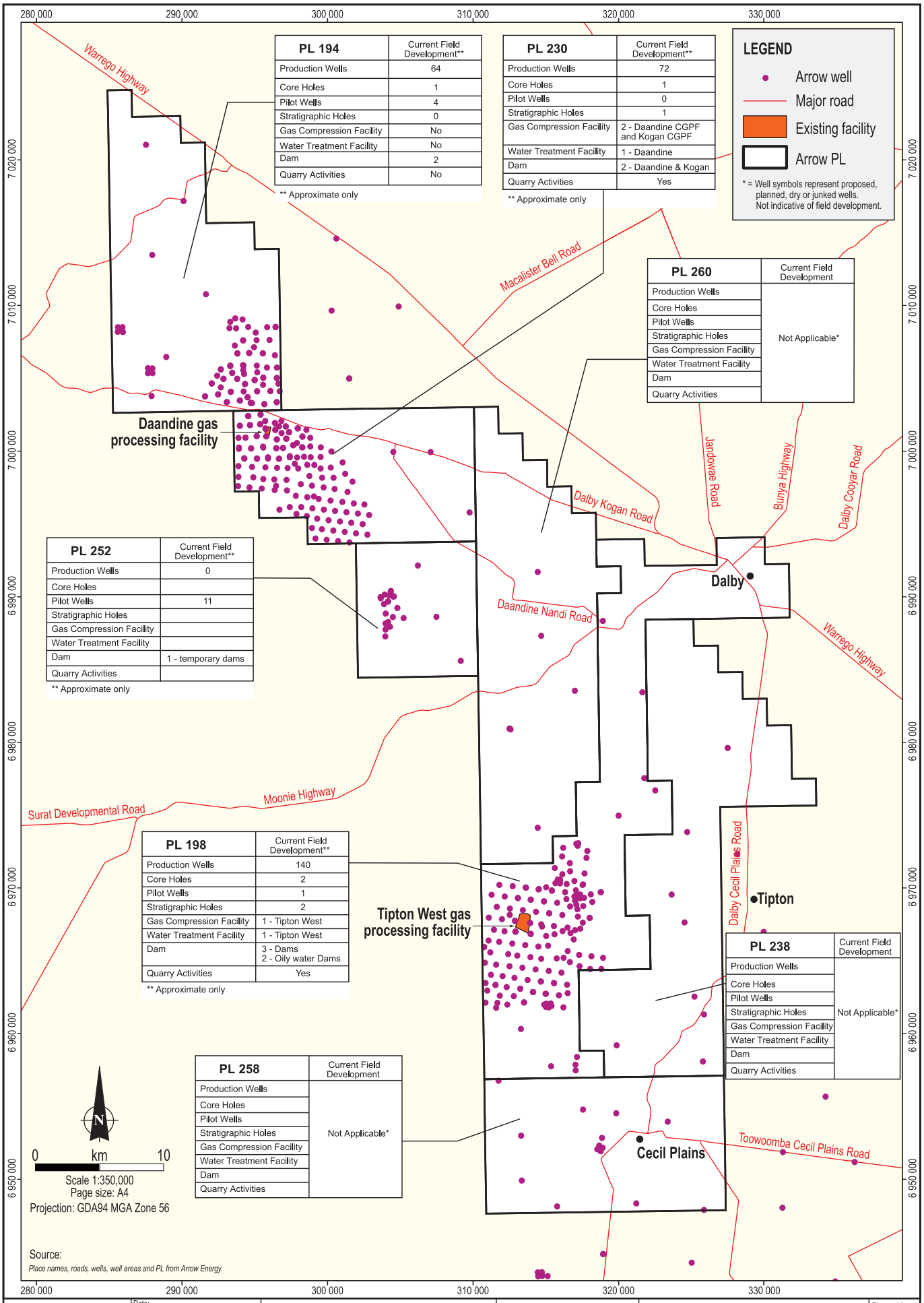
CECIL PLAINS
Legend
Proposed Pipeline Connection to Sales Gas Infrastructure
Main Road
Railway
Management Areas
Theten IPF
Stratheden IPF
Lynwood North IPF
Duntroon IPF & Well Area
Area 1
Area 2
Area 3
Area 4
N
0 km 3
Scale 1:300,000
Page size: A4
Projection: GDA 94 MGA Zone 56
Source:
Place names, roads, railways, watercourses and waterbodies from Arrow Energy.
Tenements from DME.
Proposed facility areas, well areas and project boundaries from Arrow Energy.
3D Environmental
Vegetation Assessment & Mapping Specialists
P. O. Box 959
Kenmore, Qld 4069
Phone: (07) 3411 9072
Phone: (07) 3878 4344
Mobile: 0404 577 285
Mobile: 0409 426 916
www.3denvironmental.com.au
Date: 21-12-2009
MXD: C:\3D Environmental\Arrow\DS_Info\Arrow_3D_P_A4.mxd
File Name: Fig3_20129_GIS
Arrow Energy Limited
Dalby Expansion Project
arrow energy
go further
Management Areas
Figure No:
3



3D Environmental Vegetation Assessment & Mapping Specialists P. O. Box 959 Kenmore, Qld 4069 Phone: (07) 3411 9072 Phone: (07) 3878 4344 Mobile: 0404 577 285 Mobile: 0409 426 916 www.3denvironmental.com.au	Date: 21-12-2009 MXD: C:\3D Environmental\Arrow\DS_Info\Arrow_3D_P_A4.mxd File Name: Fig1_20129_GIS	Arrow Energy Limited Dalby Expansion Project	arrow energy go further	Project Area Location and Facilities	Figure No: 1



coffey natural systems	Date: 13.01.2010 MXD: ArrowEnergy_UpstreamLNG.mxd File Name: 7040AA_07_F001_GIS_GL	Arrow Energy Limited Dalby Expansion Project	arrowenergy go further	Dalby Expansion Project development areas	Figure No: 1



PL 194	Current Field Development**
Production Wells	64
Core Holes	1
Pilot Wells	4
Stratigraphic Holes	0
Gas Compression Facility	No
Water Treatment Facility	No
Dam	2
Quarry Activities	No

** Approximate only

PL 230	Current Field Development**
Production Wells	72
Core Holes	1
Pilot Wells	0
Stratigraphic Holes	1
Gas Compression Facility	2 - Daandine CGPF and Kogan CGPF
Water Treatment Facility	1 - Daandine
Dam	2 - Daandine & Kogan
Quarry Activities	Yes

** Approximate only

LEGEND

- Arrow well
- Major road
- Existing facility
- Arrow PL

* = Well symbols represent proposed, planned, dry or junked wells. Not indicative of field development.

PL 260	Current Field Development
Production Wells	Not Applicable*
Core Holes	
Pilot Wells	
Stratigraphic Holes	
Gas Compression Facility	
Water Treatment Facility	
Dam	
Quarry Activities	

PL 252	Current Field Development**
Production Wells	0
Core Holes	
Pilot Wells	11
Stratigraphic Holes	
Gas Compression Facility	
Water Treatment Facility	
Dam	1 - temporary dams
Quarry Activities	

** Approximate only

PL 198	Current Field Development**
Production Wells	140
Core Holes	2
Pilot Wells	1
Stratigraphic Holes	2
Gas Compression Facility	1 - Tipton West
Water Treatment Facility	1 - Tipton West
Dam	3 - Dams 2 - Oily water Dams
Quarry Activities	Yes

** Approximate only

PL 238	Current Field Development
Production Wells	Not Applicable*
Core Holes	
Pilot Wells	
Stratigraphic Holes	
Gas Compression Facility	
Water Treatment Facility	
Dam	
Quarry Activities	

PL 258	Current Field Development
Production Wells	Not Applicable*
Core Holes	
Pilot Wells	
Stratigraphic Holes	
Gas Compression Facility	
Water Treatment Facility	
Dam	
Quarry Activities	

coffey natural systems

Date: 13.01.2010
MXD: ArrowEnergy_UpstreamLNG.mxd
File Name: 7040_07_F002_GIS_GL

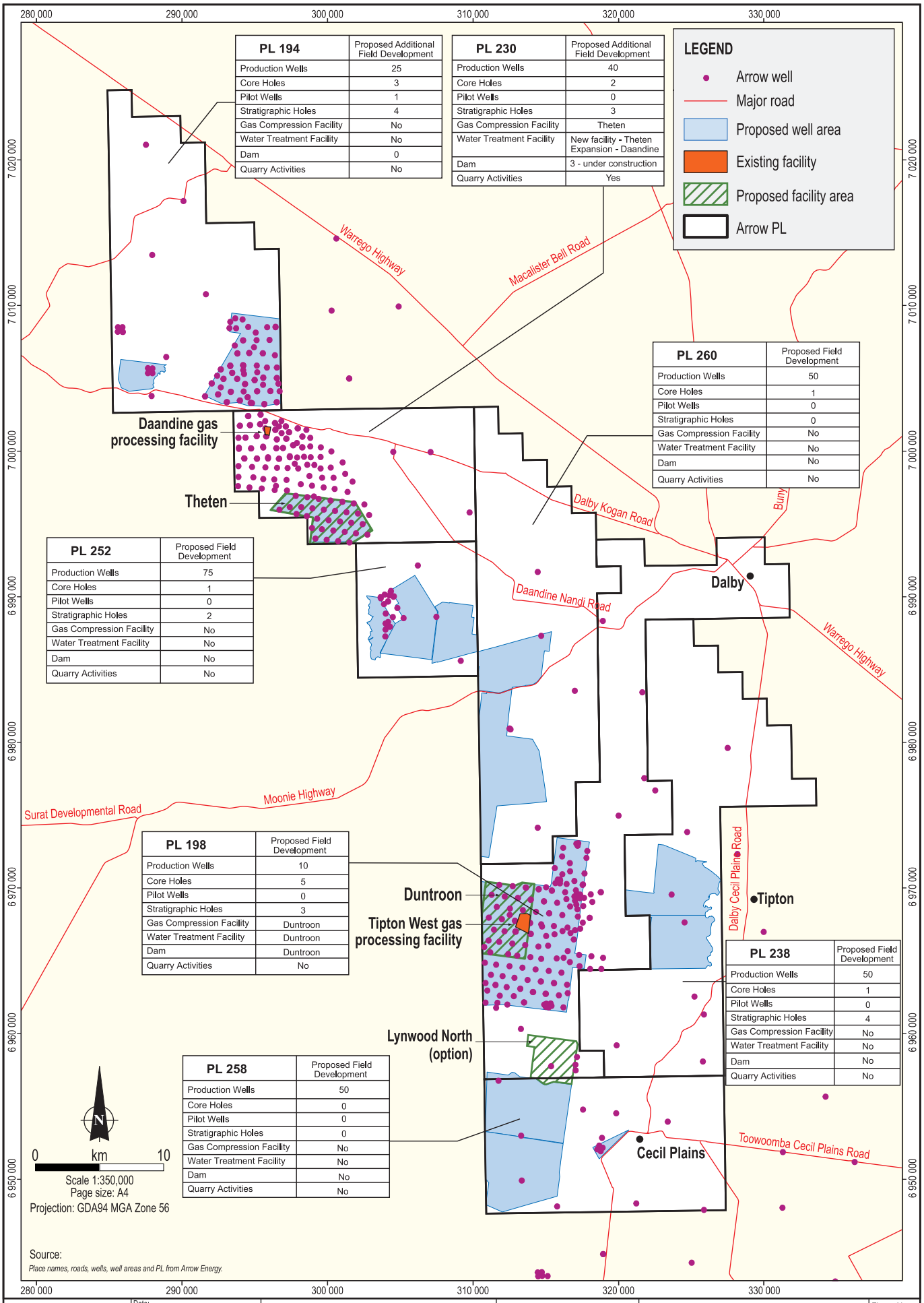
Arrow Energy Limited

Dalby Expansion Project

arrowenergy go further

Current field development information

Figure No: 2



PL 194	Proposed Additional Field Development
Production Wells	25
Core Holes	3
Pilot Wells	1
Stratigraphic Holes	4
Gas Compression Facility	No
Water Treatment Facility	No
Dam	0
Quarry Activities	No

PL 230	Proposed Additional Field Development
Production Wells	40
Core Holes	2
Pilot Wells	0
Stratigraphic Holes	3
Gas Compression Facility	Theten
Water Treatment Facility	New facility - Theten Expansion - Daandine
Dam	3 - under construction
Quarry Activities	Yes

PL 260	Proposed Field Development
Production Wells	50
Core Holes	1
Pilot Wells	0
Stratigraphic Holes	0
Gas Compression Facility	No
Water Treatment Facility	No
Dam	No
Quarry Activities	No

PL 252	Proposed Field Development
Production Wells	75
Core Holes	1
Pilot Wells	0
Stratigraphic Holes	2
Gas Compression Facility	No
Water Treatment Facility	No
Dam	No
Quarry Activities	No

PL 198	Proposed Field Development
Production Wells	10
Core Holes	5
Pilot Wells	0
Stratigraphic Holes	3
Gas Compression Facility	Duntroon
Water Treatment Facility	Duntroon
Dam	Duntroon
Quarry Activities	No

PL 238	Proposed Field Development
Production Wells	50
Core Holes	1
Pilot Wells	0
Stratigraphic Holes	4
Gas Compression Facility	No
Water Treatment Facility	No
Dam	No
Quarry Activities	No

PL 258	Proposed Field Development
Production Wells	50
Core Holes	0
Pilot Wells	0
Stratigraphic Holes	0
Gas Compression Facility	No
Water Treatment Facility	No
Dam	No
Quarry Activities	No

coffey natural systems

Date: 26.11.2009
MXD: ArrowEnergy_UpstreamLNG.mxd
File Name: 7040AA_07_F003_GIS_GL

Arrow Energy Limited

Dalby Expansion Project

arrowenergy go further

Proposed additional field development

Figure No: 3

16/04/2010: Dalby Expansion Project -2010/5343 Approved - Water trigger does not apply

- Commenced minor works June 2015
- DXP approval superseded when works commenced for SGE on 22/10/2020

s. 22(1)(a)(ii)

15/05/2017: Condition 14 WMMP approved

18/12/2018: Stage 1 approved (

02/07/2019: Variation CoA approved -four in total

22/11/2019: DAWE approves updated WMMP with Stage 1 data (Condition 17)

- 13(g) requires a subsidence monitoring program. In place using InSAR satellite technology (App K)
- 8m x 5m grid, omitted ploughed fields (unreliable). Further averaged by Arrow at 30m spacing

20/07/2020: Letter from s. 47F(1) > Minister for Ag David Littleproud

- Daandine (near Dalby) onsite farm and upstream subsidence risk / 400 ha flood irrigation
  - "As irrigators, our attention was drawn to ***risk*** of disruption"
- Insufficient baseline monitoring/reliable data for ploughed fields prior to commencement (no liability)
  - Landowners discouraged from collecting own data as considered 'inaccurate'
  - Sceptical of modelling
- Further reference to 'uplift' as consequence of subsidence in surrounding areas (thesis attached)
- Request to Minister to reconsider the decision in accordance with s78 of the EPBC Act and cease production across cultivated areas

03/08/2020: Electorate Officer s. 47F(1) of M.Littleproud > DLO Ley.

- Subsidence claims inaccurate based on original e-mail
- "The constituent has reported existing wells in the vicinity of her property with some alleged subsidence as a result of CSG operations and is afraid continued expansions will have adverse impact on her agricultural interests and the environment. Further, she believes no one is monitoring compliance with the plans which has been evidenced by her interactions with the company and the publicly available documents"
- Registered by DAWE for Ministerial reply. CC'd s. 22(1)(a)(ii)

01/04/2020: Arrow meets with PAS to discuss water monitoring locations and management requirements

- Change to subsidence monitoring locations due to operational constraints

22/04/2020: Arrow requests advice from PAS on GW compliance obligations for both approvals

22/06/2020: OoC/PAS/EAS response offers guidance to Arrow.

- Request for analysis of MB1 data undertaken to support compliance with CoA and GMMP
- Notes commitment to biannual pressure readings unable to be undertaken for operational reasons
  - Arrow must submit a revised WMMP (CoA 31) / GMMP (CoA 34)

01/09/2020: M.Ley > M. Littleproud

- s78 can only apply to the Dalby Expansion Project (2010/5343), which the WMMP does not relate to
- Reference to s142: requires approval holder to comply with conditions
- Compliance to make enquiries

22/10/2020: commencement of action. DAWE notified 18 Nov

10/11/2020: Arrow submits revised WMMP (Rev 1) to DAWE

16/11/2020: Compliance quick brief: DAWE has yet to be notified that the project has commenced (?)

18/11/2020: Arrow notified DAWE of Commencement of Action on 22 October 2020

24/11/2020: s. 47F(1) > M. Littleproud Report: *Subsidence Baseline & Monitoring Issues Arrow Energy*

- Alleged breach of conditions, insufficient/ non-existent baseline monitoring

25/11/2020: Arrow 5343 status update – "since June 2015 Arrow has continued to develop the Dalby field progressively including the construction of approx. 160 additional CSG production wells and water monitoring bores and an upgrade to the Daandine Compressor Station"

27/11/2020: Minister Littleproud > Minister Ley + Report

23/12/2020: Minister Ley > Minister Littleproud.

- Dept believes Arrow to be compliant with WMMP + 13g (approved 18 Dec 2018)
- Absence of Qld regulatory controls and the EPBC conditioned WMMP in response to subsidence risks
- Development of the JIF

15/02/2021: M. Ley and M. Littleproud met with local constituents to discuss concerns over CSG related impacts on subsidence and surface water flows on farms in Dalby and Cecil Plains, and the productivity of affected land.

- They noted the lack of Qld regulatory controls and concerns regarding the fit for purpose WMMP produced by Arrow Energy in regards to subsidence risks
  - Minister Ley asked the Dept to review enforceable EPBC conditions regarding subsidence
  - Further engage with Qld officials to better understand their approach to subsidence and SW management. Note: State regulation does not include subsidence
- M. Littleproud supported the proposed actions and welcomed M. Ley's offer to stay engaged with the delegation on these matters

16/02/2021: Andrew McNee (Ass. Sec EAD) > brief to Rosemary (Dep Sec Ag) update on meeting and JIF

19/02/2021: s. 47F(1) (local constituent) > M. Ley. Thankyou for meeting / request for further investigation

- Questioned if DAWE notified of potential non-compliance CoA 29 (within 10 days)
- Not achieved baseline monitoring for subsidence
- Arrow report by Coffey revealed inaccuracy of InSAR
- Agreed with suggestion to commission an updated report by IESC on subsidence from CSG operations

22/02/2021: Rosemary Deininger acknowledged CC'd soils team s. 22(1)(a)(ii) > Kim Farrant

24/02/2021: OWS, OoC and WRRS meeting to discuss next steps

Unclassified

Department of the Environment, Water, Heritage and the Arts

EPBC 2010/5343 DALBY GAS ARROW ENERGY

UNCLASSIFIED

FILE COVER 2010/02842

APPROVALS AND WILDLIFE DIVISION

Owner Location MINING SECTION - AWD
Date Created 02/02/2010

REGULATION - ASSESSMENT - ENVIRONMENTAL IMPACT (EI) - REFERRAL / ASSESSMENT / APPROVAL - ARROW ENERGY - ENERGY GENERATION AND SUPPLY (NON-RENEWABLE) - SURAT BASIN - QLD - DALBY GAS EXPANSION PROJECT - EPBC 2010/5343

Mag1 DIS 5/2025 1/10 - 5/10

Previous Part

Action Record - The next movement of the file must be indicated

Next Part

Folio No. (1)	Referred to (2)	Date (3)	Date Cleared (4)	Initials (5)
1	James Bostock PA	2/2/10		
	s. 22(1)(a)(ii)			
		19/2/14		
	s. 22(1)(a)(ii)			
		put away 25/2/2014		

Folio No. (1)	Referred to (2)	Date (3)	Date Cleared (4)	Initials (5)

Records are Evidence

Archival Action

Retain/ Review Date	
Destroy Date	
Schedule Number/ Class Number	

2010/02842

Unclassified

2480 2010 2010/02842

s. 22(1)(a)(ii)

From: Barker, James
Sent: Monday, 19 April 2010 9:48 AM
To: s. 22(1)(a)(ii)
Subject: FW: Dalby Expansion Project EPBC Decision [SEC=UNCLASSIFIED]
Categories: UNCLASSIFIED
Attachments: Decision notice- NCA-PM.pdf; Letter to proponent.pdf

fyi too.

From: s. 47F(1) @arrowenergy.com.au]
Sent: Friday, 16 April 2010 4:10 PM
To: s. 22(1)(a)(ii)
Cc: s. 47F(1) ; Barker, James
Subject: FW: Dalby Expansion Project EPBC Decision [SEC=UNCLASSIFIED]

s. 22(1)(a)(ii)

Thank you for email with the EPBC decision notice for the Dalby Expansion Project.

Arrow appreciate the proactive engagement that has taken place with DEWHA during the assessment of this referral and the Surat Gas Project referral, and look forward to our ongoing engagement during the EIS process for the Surat Gas Project.

Thanks again for your assistance.

Regards,

s. 47F(1)

From: s. 22(1)(a)(ii) @environment.gov.au]
Sent: Friday, 16 April 2010 3:52 PM
To: s. 47F(1)
Subject: Dalby Expansion Project EPBC Decision [SEC=UNCLASSIFIED]

Good afternoon,

Please find attached the decision notice and letter for the Dalby Expansion Project, EPBC 2010/5343 which was referred under the EPBC Act.

It has been determined that the project is not a controlled action, provided it is taken in accordance with the manner described in the attached decision notice. This means that provided that the action is undertaken in that way, it does not require further assessment and approval under the EPBC Act before it can proceed.

Kind regards,

s. 22(1)(a)(ii)

Referrals Business Entry Point
Queensland Section
Environment Assessment Branch
Approvals & Wildlife Division
Department of the Environment, Water, Heritage and the Arts
Ph: s. 22(1)(a)(ii)

If you have received this transmission in error please notify us immediately by return e-mail and delete all copies. If this e-mail or any attachments have been sent to you in error, that error does not constitute waiver of any confidentiality, privilege or copyright in respect of information in the e-mail or attachments.

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Australian Government
Department of the Environment, Water, Heritage and the Arts

Environment Protection and Biodiversity Conservation Act

Referral detail

Use the pulldown lists and search box to define what you want to see: [How to use this site] [Search Tips]

List: Referrals list **In:** Last 7 days **Search:** GO

Title of Referral: **Arrow Energy/Energy generation and supply (non-renewable)/Surat Basin/QLD/Dalby Gas Expansion Project**

Date Received: 02 Feb 2010 Reference Number: 2010/5343

Notification from EPBC Act	Date of Notice	Documents
• Decision whether action needs approval/Approval Not Required - particular manner	16 Apr 2010	
• Invitation for Public Comment on Referral/Comments not received	02 Feb 2010	

s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Friday, 16 April 2010 15:52
To: s. 47F(1)@arrowenergy.com.au'
Subject: Dalby Expansion Project EPBC Decision [SEC=UNCLASSIFIED]
Categories: UNCLASSIFIED
Attachments: Decision notice- NCA-PM.pdf; Letter to proponent.pdf

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Kind regards,

s. 22(1)(a)(ii)

Referrals Business Entry Point
Queensland Section
Environment Assessment Branch
Approvals & Wildlife Division
Department of the Environment, Water, Heritage and the Arts
Ph: s. 22(1)(a)(ii)

REFERRAL DECISION BRIEF – DALBY EXPANSION PROJECT, DALBY, QLD, (EPBC 2010/5343)

Public Affairs Consulted: No
DEWHA File: 2010/02842

For: Mary Colreavy, AS, EAB **Deadline and reason:** **ASAP** - statutory timeframe from database was 16 March 2010.

Recommended Decision	**NCA** ☐ **NCA(pm)** ☒ **CA** ☐
Person proposing the action	Arrow Energy
Controlling Provisions triggered or matters protected by particular manner	World Heritage (s12 & s15A) Yes ☐ No ☒ No if PM ☐ National Heritage (s15B & s15C) Yes ☐ No ☒ No if PM ☐ Wetlands (Ramsar)(s16 & s17B) Yes ☐ No ☒ No if PM ☐ Threatened Species (s18 & s18A) Yes ☐ No ☐ No if PM ☒ Migratory Species (s20 & s20A) Yes ☐ No ☒ No if PM ☐ C'wealth marine (s23 & 24A) Yes ☐ No ☒ No if PM ☐ Nuclear actions (s21 & 22A) Yes ☐ No ☒ No if PM ☐ C'wealth land (s26 & s27A) Yes ☐ No ☒ No if PM ☐ C'wealth actions (s28) Yes ☐ No ☒ No if PM ☐ GBRMP (s24B & s24C) Yes ☐ No ☒ No if PM ☐ See Attachment B for list C'wealth heritage o/s (s27B & 27C) Yes ☐ No ☒ No if PM ☐
Public Comments	Yes ☐ No ☒
Ministerial Comments	Yes ☒ No ☐ Who: Queensland Department of Environment and Resource Management; Department of Defence See Attachment C
SPRAT	Has data been provided to SIS? Yes ☐ No ☒

Recommendations:

We recommend that you:

1. Consider the referral documentation at Attachment A — 1. Noted/ Please discuss
2. Consider your legal obligations for decision-making at Attachment B and the comments received at Attachments C and D — 2. Noted/ Please discuss
3. Agree with the recommended decision — 3. Agreed/Not agreed
4. Sign the notice at Attachment E (which will be published if you make the recommended decision) — 4. Signed/ Not signed
5. Sign the letters at Attachment E — 5. Signed/ Not signed

s. 47F(1)

Mary Colreavy
AS EAB
16 / 04 / 2010

s. 47F(1)

Key Issues:

Sensitivities

- This proposal is related to Arrow Energy's Surat Gas Project (EPBC 2010/5344), which is situated within the same general area as the Dalby Expansion Project. On 8 February 2010 further information was requested from the proponent about why the two referrals should be considered as separate actions. Arrow Energy met with the Department on 15 February 2010 and responded by letter dated 19 February 2010 detailing reasons as to why the two referrals should not be considered parts of a larger action. These reasons were accepted. Arrow Energy states that its existing coal seam gas operations at Dalby have not been referred as they have had no impact on matters of national environmental significance. They also state that they have referred the Dalby Expansion Project as the proposed activities are in close proximity to EPBC-listed ecological communities. See Attachment F for more information.
- The proposed Particular Manner is based on commitments contained in the 'Environmental Management Standard Operating Procedures – Vegetation and Habitat' document submitted as part of the referral documentation. In this SOP, the company makes a commitment to undertake a number of activities to minimise the impact to both state and Commonwealth listed species and communities, including pre-clearance surveys with the placement of well and infrastructure configuration to be determined based on the results of these surveys.
- The Monitoring and Audit Section were consulted on the proposed referral decision and they raised concerns that the proposed decision was inconsistent with the Department's guidance note on particular manner decisions (see Attachment G) as it requires the proponent to undertake pre-clearance surveys and to report on their findings. A meeting with MAS Director Mike Smith was held and after gaining a greater understanding of the project, Mike stated that while he believed that while all decisions should be in accordance with department guidelines, in his view the proposed decision approach was a practical one given the lack of certainty regarding the impacts of the action.

Summary of significant impacts

- The proposed action has the potential to significantly impact on listed threatened species and ecological communities through direct removal of vegetation and species habitat and indirect impacts such as spread of weeds. See Attachment B for more detail.
- However the proponent has stated in the referral that they have the ability to site gas wells, pipelines and infrastructure away from areas of potential habitat for EPBC-listed species and ecological communities and have committed to avoid these areas and minimise any unavoidable impacts. If surveys for EPBC-listed ecological communities and threatened species habitat are conducted prior to any vegetation disturbance and avoidance and minimisation procedures are followed, it is considered that any impacts on listed threatened species and ecological communities are unlikely to be significant. The decision notice at Attachment E reflects these requirements and outlines the particular manner in which the proposed action is to be taken.

Background:

- The referral was received on 2 February 2010 (Attachment A). The action was referred by Coffey Natural Systems on behalf of Arrow Energy who stated their belief that the proposal is not a controlled action for the purposes of the EPBC Act.
- The proposal involves an increase of the production capacity of Arrow Energy's Surat Basin operations which includes an expansion of existing gas field operations centred around the town of Dalby within the Tipton West, Daandine, Stratheden and Kogan North and through the initial development of Plainview, Long Swamp and Meenwarra gas fields.
- The proposed action would involve the development of up to 300 new production wells, two integrated production facilities including gas compression, water treatment, power generation and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure.

- The proponent was consulted on a draft of the particular manner decision notice. Minor comments in relation to wording were received on 31 March 2010 and the decision notice was amended to reflect these comments.

Submissions:

Public submissions

- The referral was published on the Department's website on 2 February 2010. The Department received no public submissions.

Comments from Commonwealth Ministers

- The Minister for Resources and Energy, the Hon. Martin Ferguson was informed of the referral by letter dated 2 February 2010 and invited to provide comment. No comments were received.
- The Minister for Climate Change and Water, Senator the Hon. Penny Wong was informed of the referral by letter dated 2 February 2010 and invited to provide comment. No comments were received.
- The Minister for Defence, Senator the Hon. John Faulkner was informed of the referral by letter dated 8 February 2010 and invited to provide comment. Comments were received on 18 February 2010 stating that the proposed action is unlikely to have any impacts on Commonwealth land. See Attachment C for more information.

Comments from State Ministers

- The Queensland Minister for Climate Change and Sustainability, the Hon. Kate Jones was also informed of the referral in a letter dated 2 February 2010, and invited to provide comment. Comments were received from the Queensland Department of Environment and Resource Management (DERM) on 19 February 2010, stating that the proposal will not be assessed using the EIS process in chapter three of the *Environmental Protection Act 1994*. DERM also advised that they had received an application for a level 1 Petroleum Activity for the proposal under the *Environmental Protection Act 1994*. See Attachment C for more information.

Summary of protected matters that are not controlling provisions:

See Attachment B for details.

s. 22(1)(a)(ii)

Primary Contact

s. 22(1)(a)(ii)

A/g Director
Mining Section
14 /04/2010

Consultation: Wetlands Section, Heritage Division; Monitoring and Audit Section

Attachments:

A	Referral including attachments
B	Legal considerations and further advice on matter of NES
C	Letter from Qld DERM and Department of Defence
D	Wetlands and Heritage advice
E	Decision notice and letters
F	Letter from Arrow Energy
G	NCA-PM Guidance Note

B

Attachment B: Legal Obligations and Supporting Advice – 2010/5343

Decision on Non-controlled Action- Particular Manner

The Department has reviewed the information in the referral against the EPBC Act Policy Statement 1.1 *Significant Impact Guidelines – Matters of National Environmental Significance* (May 2006) and other relevant material. While this material is not binding or exhaustive, the factors identified are considered adequate for decision-making in the circumstances of this referral, and there is no reason to depart from this material or consider additional factors. Adequate information is available for decision making for this proposal.

Section 75

Under s75 of the EPBC Act, you must decide whether the action that is the subject of a proposal referred is a controlled action and which provisions of Part 3 (if any) are controlling provisions for the action. In making your decision you must consider all adverse impacts the action has, will have, or is likely to have on the matter protected by each provision of Part 3, and you must not consider any beneficial impacts on the matter.

You must also consider any comments received from responsible Commonwealth Ministers and appropriate State or Territory Ministers (s74) and agencies, to the extent that they are relevant.

You must also consider any comments received from the public. The referral was made available for public comment on 2 February 2010 for 10 business days as required under the EPBC Act and no comments were received.

Based on the available information, including the referral, the Department is of the view that the proposed action be determined **not a controlled action as long as it is carried out in a particular manner**.

Description of Proposed Action

Arrow Energy proposes to increase the production capacity of its Surat Basin operations through the Dalby Expansion Project. The project will involve an expansion of existing gas field operations around the Dalby area including the development of up to 300 new production wells, two integrated production facilities and high pressure gas pipelines.

Potential Impacts on Matters of National Environmental Significance

Listed threatened species and ecological communities

The Department's Environmental Reporting Tool (ERT) identified 25 listed threatened species with the potential to occur within 2km of the proposed project site.

The following table is the Department's assessment of the likelihood of significant impact on listed threatened species.

Threatened fauna species		
Species	**Discussion**	**Significant impact likely?**
Murray Cod *Maccullochella peelii peelii* **Vulnerable**	These species all have the potential to occur within the project area of the proposed action and have been identified by the Environmental Reporting Tool as potentially occurring within a 2km radius. The specific locations of gas wells, pipelines and infrastructure are not able to be finalised until the project commences. There is the potential for the proposed action to adversely affect habitat critical to the survival of these species such as foraging and breeding habitat as well as the potential to fragment or reduce the area of occupancy of a population of these species. A significant impact on these species is therefore considered likely. However, the proponent has stated in the referral that they will avoid EPBC-listed fauna habitat and instigate mitigation measures to reduce potential indirect impacts. Mitigation measures involve following environmental management standard operating procedures which were included in the referral documentation. Due to the ability for the project proponent to locate gas wells, pipelines and infrastructure away from potential habitat, and provided the proponent undertakes the action in the particular manner outlined in the decision notice at Attachment E, any impacts on these fauna species are not considered likely to be significant.	No if undertaken in a particular manner
Regent Honeyeater *Anthochaera phrygia* **Endangered**		
Red Goshawk *Erythriotriorchus radiatus* **Vulnerable**		
Squatter Pigeon (southern) *Geophaps scripta scripta* **Vulnerable**		
Swift Parrot *Lathamus discolour* **Endangered**		
Star Finch *Neochmia ruficauda ruficauda* **Endangered**		
Australian Painted Snipe *Rostratula australis* **Vulnerable**		
Large-eared Pied Bat *Chalinobolus dwyeri* **Vulnerable**		
Northern Quoll *Dasyurus hallucatus* **Endangered**		
Greater Long-eared Bat (south-eastern form) *Nyctophilus timoriensis* **Vulnerable**		
Five-clawed Worm Skink *Anomalopus mackayi* **Vulnerable**		
Collared Delma *Delma torquate* **Vulnerable**		
Dunmall's Snake *Furina dunmalli* **Vulnerable**		
Grassland Earless Dragon *Tympanocryptis pinguicolla* **Endangered**		

Threatened flora species		
Species	**Discussion**	**Significant impact likely?**
Philotheca sporadica **Vulnerable** *Acacia chinchillensis* **Vulnerable** Ooline *Cadellia pentastylis* **Vulnerable** King Blue-grass *Dicanthium queenslandicum* **Vulnerable** Finger Panic Grass *Digitaria porrecta* **Endangered** Tricolour Diuris *Diuris sheaffiana* **Vulnerable** *Homopholis belsonii* **Vulnerable** Hawkweed *Picris evae* **Vulnerable** Austral Cornflower *Rhaponticum australe* **Vulnerable** Austral Toadflax *Thesium australe* **Vulnerable** *Tylophora linearis* **Endangered**	These species all have the potential to occur within the project area of the proposed action and have been identified by the Environmental Reporting Tool as potentially occurring within a 2km radius. The specific locations of gas wells, pipelines and infrastructure are not able to be finalised until the project commences. There is the potential for the proposed action to adversely affect habitat critical to the survival of these species as well as the potential to fragment or reduce the area of occupancy of a population of these species. A significant impact on these species is therefore considered likely. However, the proponent has stated in the referral that they will avoid EPBC-listed flora species and instigate mitigation measures to reduce potential indirect impacts. Mitigation measures involve following environmental management standard operating procedures which were included in the referral documentation. Due to the ability for the project proponent to locate gas wells, pipelines and infrastructure away from potential habitat, and provided the proponent undertakes the action in the particular manner outlined in the decision notice at Attachment E, any impacts on these flora species are not considered likely to be significant.	No if undertaken in a particular manner

Threatened Ecological communities		
Community	**Discussion**	**Significant impact likely??**
Brigalow (*Acacia harpophylla* dominant and co-dominant)	This community has been identified within the project area for the proposed action. The specific locations of gas wells, pipelines and infrastructure are not able to be finalised until the project commences. There is the potential for the proposed action to fragment or increase fragmentation of this community, reduce the extent of this community and result in the introduction of weed species. However, the proponent has stated in the referral that they intend to avoid EPBC-listed communities and minimise clearance where impacts are unavoidable. Minimisation measures involve following environmental management standard operating procedures which were included in the referral documentation. Due to the ability for the project proponent to locate gas wells, pipelines and infrastructure away from this ecological community, and provided the proponent undertakes the action in the particular manner outlined in the decision notice at Attachment E, any impacts on this ecological community are not considered likely to be significant.	No if undertaken in a particular manner

Threatened Ecological communities		
Community	**Discussion**	**Significant impact likely??**
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	These ecological communities are considered unlikely to be present in the area of the proposed action. Queensland Regional Ecosystem mapping did not indicate their presence in the project area and field surveys did not locate these communities. A significant impact on these ecological communities is therefore considered unlikely.	No
Weeping Myall Woodlands		
White box- Yellow box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland		

Listed migratory species

The Department's Environmental Reporting Tool (ERT) identified 18 listed migratory species with the potential to occur within 2km of the proposed project site.

The following table is the Department's assessment of the likelihood of significant impact on listed migratory species.

Migratory Terrestrial Species		
Species	**Discussion**	**Significant impact likely?**
White-throated Needletail *Hirundapus caudacutus*	These species have been identified in the project area of the proposed action during field surveys. However these species have widespread distributions across Australia and are relatively common species. The proposed action is not expected or considered likely to significantly impact on an important population; an ecologically significant proportion of the population; or result in the establishment of invasive species that are harmful, for any of these migratory species.	No
Rainbow Bee-eater *Merops ornatus*		
Rufous Fantail *Rhipidura rufifrons*		
Great Egret *Ardea alba*		
Regent Honeyeater *Anthochaera phrygia*	The proposed action is not expected or considered likely to substantially modify, destroy or isolate an area of important habitat for this species; result in the establishment of an invasive species that is harmful to this species; or seriously disrupt its lifecycle. A significant impact on the Regent Honeyeater as a migratory species is not expected or considered likely.	No
White-bellied Sea Eagle *Haliaeetus leucogaster*	These migratory species have the potential to occur within the project area for the proposed action, although they were not detected during field surveys of the project area. The proposed action is not expected or considered likely to significantly impact on an important population; an ecologically significant proportion of the population; or result in the establishment of invasive species that are harmful, for any of these migratory species.	No
Cattle Egret *Ardea ibis*		
Sharp-tailed Sandpiper *Calidris acuminata*		
Curlew Sandpiper *Calidris ferruginea*		
Latham's Snipe *Gallinago hardwickii*		
Black-tailed Godwit *Limosa limosa*		
Australian Cotton Pygmy Goose *Nettapus coromandelianus albipennis*		
Painted Snipe *Rostratula benghalensis* s. lat		
Wood Sandpiper *Tringa glareola*		
Marsh Sandpiper *Tringa stagnatilis*		
Fork-tailed Swift *Apus pacificus*		

A

DALBY EXPANSION PROJECT
EPBC ACT REFERRAL

Arrow Energy

January 2010

arrow energy

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Project director	s. 47F(1)		
Project manager			
Version:	**Details:**	**Approved:**	**Date:**
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Australian Government

Department of the Environment, Water, Heritage and the Arts

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided that sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from the Department's web site:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.
- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.
- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act). If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referral Business Entry Point (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act. Information is available on the Department's web site.

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in green text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents. Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below two megabytes (2mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referral Business Entry Point for advice. Attachments larger than two megabytes (2mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I submit a referral?

Referrals may be submitted by mail, fax or email.

Mail to:

Referral Business Entry Point
Environment Assessment Branch
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are appreciated.

Fax to: 02 6274 1789

- Faxed documents must be of sufficiently clear quality to be scanned into electronic format.
- Address the fax to the mailing address, and clearly mark it as a 'Referral under the EPBC Act'.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes.

For more information

- call the Department of the Environment, Water, Heritage and the Arts Community Information Unit on 1800 803 772 or
- visit the web site www.environment.gov.au/epbc

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title: Dalby Expansion Project

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(j).

1.1 **Short description**

Use 2 or 3 sentences to uniquely identify the proposed action and its location.

Arrow Energy (Arrow) proposes to increase the production capacity of its Surat Basin operations through the Dalby Expansion Project. The project will involve an expansion of existing gas field operations within the Tipton West, Daandine, Stratheden and Kogan North, and through the initial development of Plainview, Long Swamp and Meenawarra gas fields. The gas fields are located 20 to 40 km south and west of Dalby, in Queensland's Surat Basin.

The Dalby Expansion Project will involve the development of up to 300 new production wells, two integrated production facilities including gas compression, water treatment, power generation and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure. Activities are scheduled to occur between 2010 and 2012.

Gas produced from the nominated fields will maintain supply under existing domestic gas sales agreements and confirm a viable gas supply to proposed export LNG projects.

1.2 **Latitude and longitude**

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

location point	Latitude			Longitude		
	degrees	minutes	seconds	degrees	minutes	seconds
5	26	52	54.34	150	50	3.92
6	26	52	54.34	150	51	3.92
7	26	53	54.34	150	51	3.92
8	26	53	54.34	150	53	3.92
9	26	54	54.35	150	53	3.92
10	26	54	54.35	150	54	3.92
11	26	57	54.35	150	54	3.92
12	26	57	54.35	150	56	3.92
13	26	58	54.34	150	56	3.92
14	26	58	54.34	150	57	3.92
15	27	4	54.35	150	57	3.91
16	27	4	54.32	151	6	3.86
17	27	5	54.32	151	6	3.86
18	27	5	54.32	151	7	3.86
19	27	6	54.32	151	7	3.86
20	27	6	54.32	151	8	3.86
21	27	7	54.32	151	8	3.86
22	27	7	54.32	151	9	3.86
23	27	8	54.32	151	9	3.86
24	27	8	54.32	151	10	3.86
25	27	9	52.72	151	10	3.86
26	27	9	58.35	151	10	3.9
27	27	9	54.34	151	10	3.9
28	27	9	54.34	151	12	3.9
29	27	10	54.34	151	12	3.9
30	27	10	54.34	151	15	3.9
31	27	9	54.34	151	15	3.9
32	27	9	54.34	151	17	3.9
33	27	10	54.34	151	17	3.9
34	27	10	54.34	151	18	3.9
35	27	12	54.34	151	18	3.9
36	27	12	54.34	151	14	3.9
37	27	13	54.34	151	14	3.9
38	27	13	54.34	151	15	3.9
39	27	14	54.34	151	15	3.9
40	27	14	54.34	151	16	3.9
41	27	15	54.34	151	16	3.9
42	27	15	54.34	151	17	3.9
43	27	16	54.34	151	17	3.9
44	27	16	54.34	151	18	3.91
45	27	18	54.34	151	18	3.91
46	27	18	54.34	151	19	3.91
47	27	19	54.34	151	19	3.91
48	27	19	54.34	151	15	3.91
49	27	34	54.27	151	15	3.65
50	27	34	54.28	151	5	3.66
51	27	14	54.34	151	5	3.87
52	27	14	54.34	151	0	3.9
53	27	9	54.35	151	0	3.9
54	27	9	54.34	150	58	3.9
55	27	8	54.34	150	58	3.9
56	27	8	54.34	150	56	3.9
57	27	7	54.34	150	56	3.9
58	27	7	54.34	150	55	3.9
59	27	4	54.35	150	55	3.91
60	27	4	54.35	150	50	3.91

The Interactive Mapping Tool may provide assistance in determining the coordinates for your project area.

If area less than 5 hectares, provide the location as a single pair of latitude and longitude references. If area greater than 5 hectares, provide bounding location points.

If the proposed action is linear (eg. a road or pipeline), provide coordinates for each turning point.

Do not use AMG coordinates.

1.3 **Locality**

Provide a brief physical description of the project location (eg. proximity to major towns, or for off-shore projects, shortest distance to mainland).

The proposed action is located approximately 20 to 40 km west of Dalby, and 200 km west of Brisbane, Queensland. The site is within the Eastern Darling Downs Province of the Brigalow Belt South Bioregion. The following figures display the region and the existing and proposed development:

- Figure 1 shows the location of the Dalby Expansion Project.
- Figure 2 shows the current field development.
- Figure 3 shows the proposed additional field development.

1.4 **Size of the development footprint or work area (hectares)**

Field Development

Production wells

The approximate area required for development of production wells is initially 60 m by 70 m for each new site. Following drilling and well establishment activities, each well site is rehabilitated leaving a production area of approximately 10 m by 10 m for well operation. Wherever possible, wells will be typically set out in a grid spacing of between 700 m and 1,200 m.

There are six key development areas, each are proposed to contain approximately 50 wells. Therefore, for the 50 proposed wells in each well area the initial area of disturbance will be approximately 0.21 sq km. As there will be six well areas, this will be an approximate area of disturbance for all new well development of 1.26 sq km. Please note, as the individual well area is reduced to 10 m by 10 m when the well is completed the total area will also be reduced to 0.03 sq km.

Gathering pipelines and access tracks

A right of way of up to 30 m (typically 18 to 24 m) width is required to install the gas and water gathering pipelines. Permanent access tracks, approximately 3 m wide, are maintained to each well site and will be typically located adjacent to the gas and water gathering lines. Existing tracks will be used where possible. The balance of the construction right of way is rehabilitated.

Integrated Production Facilities (IPF) Development

The approximate area required for each new integrated production facility is 750 m by 350 m. This area will incorporate the central gas processing, power generation and water treatment facilities. In addition, a further approximate 100 ha is required for dams to store associated water including feed water, treated water, oily water and brine concentrate.

High Pressure Gas Pipelines

A high pressure gas pipeline, approximately 5 km long, is required to connect the new IPFs to existing sales gas delivery infrastructure. The right of way required to construct this pipeline will be approximately 30 m wide.

A similar width construction right of way is required to construct the proposed 50-km-long high pressure in-field gas pipeline that will connect the proposed Theten and Duntroon IPFs to the existing Braemar II pipeline and the proposed Surat to Gladstone Pipeline.

1.5 **Street address of the site**

Arrow's Dalby site office address is:

Arrow Energy Ltd
37 Bennie Street
Dalby Qld 4405

1.6 **Lot description**

Describe the lot numbers and title description, if known.

Due to the nature of the project and the large area covered by petroleum leases or applications for leases, numerous lots will be affected by the development. A list of affected lots can be provided on request.

1.7 **Local Government Area and Council contact (if known)**
If the project is subject to local government planning approval, provide the name of the relevant council contact officer.

The proposed Dalby Expansion Project area is located within the Western Downs Regional Council in the northwest and Toowoomba Regional Council to the southeast.

1.8 **Timeframe**
Specify the timeframe in which the action will be taken including the estimated start date of construction/operation.

Field development and associated infrastructure for the expansion is anticipated to commence in early 2010. Production wells are likely to be drilled at the rate of 10 to 15 wells per month. Each integrated production facility is expected to take 12 to 18 months to construct. The proposed facilities are expected to be constructed concurrently, with commissioning of the facilities likely in late 2011 / early 2012. Construction timeframes and commissioning dates are subject to obtaining the necessary State and Commonwealth Government approvals.

The anticipated production life for the gas wells is in excess of 20 years.

1.9	**Alternatives** Does the proposed action include alternative timeframes, locations or activities?	X	No
			Yes, you must also complete section 2.2
1.10	**State assessment** Is the action subject to a state or territory environmental impact assessment?		No
		X	Yes, you must also complete Section 2.4
1.11	**Component of larger action** Is the proposed action a component of a larger action?	X	No
			Yes, you must also complete Section 2.6
1.12	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?		No
		X	Yes, provide details: The Dalby Expansion Project satisfies Arrow's need to meet its contractual obligations under current domestic gas supply agreements, as well as proving that a viable gas supply exists for proposed export LNG developments at and adjacent to Gladstone. Gas produced from the nominated facilities will be initially used to supply residential, commercial and industrial customers and in power generation for sale of electricity to the National Electricity Market. Supply over domestic market requirements will later be directed to proposed LNG developments if they achieve the necessary environmental approvals and financial commitments. The Surat Gas Project, for which a separate referral has been prepared and will be lodged concurrently with this referral, will facilitate further development of Arrow's Surat Basin coal seam gas reserves to meet the demand expected from proposed export LNG developments. The Surat Gas Project encompasses some 8,000 km^2 of the Surat Basin, with the project area extending from Wandoan in the north to Goondiwindi in the south, in an arc through Dalby. The Surat Gas Project area encompasses the Dalby Expansion Project area as shown in Figure 4. That project (the Surat Gas Project) will assess the environmental, social and economic impacts associated with development of infrastructure and facilities not described in this referral. A voluntary Environmental Impact

			Statement under the *Environment Protection Act 1994* (Qld) is being prepared by Arrow for the Surat Gas Project. The Dalby Expansion Project, a continuation of existing operations, will be assessed under the *Environment Protection Act 1994* (Qld), as a Level 1 petroleum activity not requiring an EIS. Related projects that facilitate delivery of coal seam gas to proposed export LNG developments and the developments themselves are: Surat to Gladstone Pipeline – this proposed high pressure gas pipeline will transport gas from near Kogan North in the Surat Basin to Gladstone on the Queensland coast. To be constructed and operated by Surat Gladstone Pipeline Pty Ltd, it will supply proposed LNG developments adjacent to Gladstone. An EIS under the Environment Protection Act has been prepared for the proposed pipeline. An EPBC Act referral (2009/5029) has been submitted for the project which was declared a controlled action on 15 October 2009. Assessment on preliminary information was nominated as the appropriate level of assessment for potential significant impacts on listed threatened species and communities (Sections 18 and 18A). Gladstone LNG Project – LNG Ltd proposes the development of an initial 1.5 Mtpa LNG plant on Fisherman's Landing north of Gladstone. The proposed plant is expected to take feed gas supply from the proposed Surat to Gladstone Pipeline. An EIS under the Environment Protection Act has been prepared for the proposed facility. The proposed action was referred (2008/3954) and it was determined that is was not a controlled action on 1 February 2008. Shell Australia LNG Project – Shell CSG (Australia) Pty Ltd (Shell) proposes the development of an up to 16 Mtpa LNG facility on Curtis Island off Gladstone, Queensland. The proposed plant is expected to take feed gas supply from the proposed Surat to Gladstone Pipeline. Shell is preparing an EIS under the *State Development and Public Works Organisation Act 1970* (Qld) for the project. Two EPBC Act referrals have been lodged for this project, one for the proposed feed gas pipeline, a short section of pipeline from near the Gladstone City Gate to the LNG plant (2009/5008) and a second for the LNG facility including plant and marine loading facility (2009/5007). The proposed development has been declared a controlled action and the Queensland EIS process accredited as the appropriate level of assessment.
1.13	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	X	No
			Yes, provide details:

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.6.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

Arrow proposes to expand its operations within existing and new petroleum tenements in the Surat Basin in South East Queensland. Figure 2 shows the current field development, as Petroleum Leases (PLs) and Petroleum Lease Applications (PL(A)s) within the project area. The activities are summarised in Table 1 and are provided in more detail below. Figure 3 shows the location of proposed new field development, compression and water treatment facilities and power generation infrastructure.

Gas from the Dalby Expansion Project will be used to maintain supply under existing domestic gas sales agreements, and to confirm a viable gas supply for identified liquefied natural gas (LNG) opportunities that may commence production from 2012.

Table 1 Expansion activities

Field Development	
Production wells and associated infrastructure	300 production wells and associated well infrastructure including gas and water gathering lines, communications cables and access tracks.
Integrated Production Facilities Development	
Gas processing facilities	Two new electric motor driven integrated production facilities (IPFs) with a maximum daily output of 85 TJ/d each. These include: • New facility at Theten (PL 230). • New facility at Duntroon (PL 198) which is adjacent to the existing Tipton West facility. A facility at Lynwood North is also proposed as a back-up option to the proposed Duntroon facility which remains subject to the outcome of land access negotiations and other clearances.
Water treatment facilities and disposal	• Potentially expanding water treatment facilities at Tipton West (PL 198). This is within the scope of the current Environment Authority and assessment is being undertaken by the Queensland Department of Environment and Resource Management. • A new reverse osmosis water treatment (ROWT) facility at Theten and Duntroon (or Lynwood North), and associated feed water dams, brine concentrate holding dams and treated water dams.
Power supply or generation	New power generation and distribution infrastructure to facilitate power distribution to IPFs, water treatment facilities and production wells located at Theten, and Duntroon (or Lynwood North).
Pipeline connections	• An approximate 5-km-long high pressure gas pipeline from new IPFs to existing sales gas delivery infrastructure. • A proposed 50-km-long high pressure in-field gas pipeline that will connect the proposed Theten, Duntroon IPFs and Lynwood North (if required) to the proposed Surat to Gladstone Pipeline.

Note: All field development and integrated production facilities development are being assessed through the Queensland Department of Environment and Resource Management.

FIELD DEVELOPMENT

Production wells and associated infrastructure

Arrow proposes to establish 300 production wells, as a continuation of its current activities. Where possible, the wells will be typically set out in a grid with a spacing of between 700 m and 1,200 m. The proposed development areas are shown on Figure 3.

To ensure safe operation of the drilling rig and associated equipment, the well drilling sites normally involve an area of approximately 60 m by 70 m. This is sufficiently large enough for a truck mounted drilling rig, with space around the rig for work related access and materials handling. Prior to drilling a well, a temporary site is prepared. Preparation generally involves:

- Vegetation clearance or trimming.
- Levelling of a drill pad if necessary.
- Excavation and construction of temporary pits to hold drilling fluids and water produced during drilling.
- Excavation of a pit for a ground flare.

Once wells are installed, the well site footprint is reduced to approximately 10 m by 10 m. The site is fenced to enclose the wellhead and other infrastructure (wellhead gas/water separator, control valve, monitoring, metering and communications equipment). The fenced well sites prevent stock and public access to the wellhead. The larger drilling site footprint is then rehabilitated to a land use consistent with surrounding area, or to a standard agreed with the landholder. Farming and grazing activities can continue as normal around established well sites.

If the land use is native vegetation, then site rehabilitation will utilise suitable native tree and grass species (where possible the species will be specific to the original ecosystem). Natural re-seeding of native species is likely to occur if there has been stock piling of removed topsoil, which is reused in rehabilitation. Native vegetative waste will also be spread over disturbed areas to provide a natural source of seed and additional fauna refuge. Use of native grass (or native alternative) species from inland southern Queensland will be undertaken when rapid vegetative cover is required to prevent soil loss.

There will be low-pressure gathering lines to take gas from the wells to the IPFs for compression. Water gathering lines will also be required to transfer associated water from wells to water treatment facilities.

New water and gas gathering lines will be constructed of small diameter high-density polyethylene (HDPE) pipe. Gathering lines will be buried at a minimum depth of 750 mm. The location of gathering lines and utility trenches will be agreed with landholders to minimise disruption to agricultural activities and to minimise the potential for damage to the gathering lines from agricultural machinery. Locating infrastructure within or adjacent to existing farm tracks and cultivation lines is generally favourable. Table 2 outlines the proposed development and the number of wells proposed per petroleum lease.

Table 2 Proposed well development

Petroleum Lease	Number of Existing Production Wells	Number of New Production Wells	Total Number of Production Wells
PL 194	64	**35**	99
PL 198	140	**25**	165
PL 230	72	**40**	112
PL 252	0	**50**	50
PL 238	0	**50**	50
PL(A) 258	0	**50**	50
PL(A) 260	0	**50**	50
Total	**276**	**300**	**576**

INTEGRATED PRODUCTION FACILITIES

Central Gas Processing Facilities

Compression facilities receive gas from the gathering lines, and compress and dewater the gas, prior to directing it to sales gas pipelines. Arrow proposes to construct two new electric motor driven IPFs on PL 230 and PL 198. These facilities are called the Theten IPF and the Duntroon IPF (the latter being a new facility located adjacent to the existing facility). The facilities will each have a maximum daily output of approximately 85 TJ/d.

The Lynwood North facility is proposed as a back-up option to the proposed Duntroon facility which remains subject to the outcome of land access negotiations.

Each facility will include a control room to monitor field development. There will also be service buildings, offices and a flare system. Communication between facilities will be via fibre optic link.

Arrow proposes to co-locate central gas processing, water treatment and power generation facilities.

The proposed IPF sites have been selected on the grounds of environmental sensitivity and ease of construction and operation. Flora and fauna constraints mapping has been undertaken to ensure that facility sites have minimal impact on sensitive ecological values.

Water Treatment Facilities and Disposal

Expansion of Existing Facilities

A reverse osmosis water treatment plant is currently being commissioned at Daandine with a new purpose built fully lined feed water dam, clay lined treated water dam, and a lined waste water dam. Brine concentrate is discharged into an existing dam recently recertified for this purpose.

On current forecasts, Tipton West (adjacent to the Duntroon site) may require expansion of its capabilities by mid 2010, depending on the production forecasts and timing of construction of the Duntroon facility. The expansion would comprise a reverse osmosis water treatment plant, new feed and treated water dams, with brine handling managed in existing dams, which will be certified as fit for purpose. The expansion of the facilities will be assessed by the Queensland Department of Environment and Resource Management.

New Facilities

Two new reverse osmosis water treatment facilities will be constructed. These will be co-located with the new central gas processing facilities at Theten and Duntroon as shown in Figure 3. The water treatment facilities will also be proposed at the Lynwood North site, if the Duntroon site provides to be unviable.

The new water treatment facilities are each proposed to include a fully lined feedwater dam, unlined treated water dam, nominally two lined concentrated brine dams, and a lined wastewater dam.

Potential beneficial uses for treated water are being investigated by Arrow. The current base-case water management strategy is to use the treated water for irrigation within the vicinity of proposed operations. Delivery points target existing irrigation infrastructure, however it is possible that additional infrastructure will be constructed to manage the increased supply of water for irrigation. Once the beneficial reuse planning is finalised, any new infrastructure required will be assessed by the Queensland Department of Environment and Resource Management and will be referred to DEWHA under the EPBC Act if required.

Arrow, in conjunction with other Surat Basin coal seam gas producers, is also considering a long-term aggregated solution for water treatment, treated water distribution and brine disposal.

Power Supply or Generation

Arrow proposes to construct gas-engine driven power stations at each integrated facility site. The approximate output of each power station would be 30 to 40 MW. Power station sizing has been determined by overall power requirements for gas compression, water treatment and wells associated with the facility. The latter

would only be electric powered where practicable. In all other instances they would be powered by gas driven generators at the production well site.

Initial wells will be powered using gas driven generation sets located at the well site.

Gas from the field gathering system will be fed directly to the power station gas-engine generators. Facilities will be put in place at the inlet of the power station to control any free water and / or particulates which may be present in the gathering piping.

Power from the stations will be used within the facility footprint area to meet the power requirements for gas compression and water treatment. Power will also be distributed to the adjacent gas field via a combination of overhead and underground cabling located within service corridors.

High Pressure Gas Pipelines

A proposed 50-km-long high pressure in-field gas pipeline will connect the proposed Theten and Duntroon IPFs to the existing Braemar II pipeline and the proposed Surat to Gladstone Pipeline near Kogan North. In the event that the Lynwood North facility is progressed in favour of the Duntroon facility, the proposed high pressure pipeline would be extended south to Lynwood North.

The high pressure gas pipeline route has been selected (as for all infrastructure in the Dalby Expansion Project) to avoid areas of moderate or high environmental sensitivity / constraints and activity based environmental management processes and controls will apply (as for gathering lines). The proposed pipeline route is shown on Figure 5. The detailed route of the pipeline within this general alignment will be dependent on land access negotiations and the application of the Arrow's Environmental Management Standard Operating Procedure for Site Selection, including reference to environmental constraints maps.

The pipeline will be designed, constructed and decommissioned in accordance with Australian Standard 2885 and any additional requirements adopted for the Surat to Gladstone Pipeline.

Final Decommissioning and Rehabilitation

Wells will be decommissioned when they reach the end of their useful life. All surface equipment will be removed, the well casing will be cut off (approximately 1.5 m) below the ground surface and the well hole plugged with concrete. The well site fence will be removed and the site rehabilitated to a land use consistent with the local area, or as agreed with the landholder. Rehabilitation may involve reinstatement of original contours, regrading surface topsoils, ensuring erosion controls are in place, and re-establishing drainage lines and pasture species (or alternative arrangements agreed with the landholder).

All other infrastructure will be removed from the site (IPF, water treatment facilities, power supply) and the land rehabilitated to its former land use (where possible). Water dams and access tracks may be useful for landholder. An agreement will be in place if infrastructure is to remain for landholder purposes.

2.2 Alternative locations, time frames or activities that form part of the referred action

If you have identified that the proposed action includes alternative timeframes, locations or activities (in section 1.9) you must complete this section. Describe any alternatives related to the physical location of the action, time-frames within which the action is to be taken and alternative methods or activities for undertaking the action. Please note, if the action that you propose to take is determined to be a controlled action, any alternative locations, timeframes or activities that are identified here may be subject to environmental assessment and a decision on whether to approve the alternative.

Facility sites have been selected with consideration environmental conditions and ease of construction and operation. Well sites locations will also be selected using analysis of environmental conditions to ensure minimal impact on the environment.

Environmental constraints mapping has been conducted to ensure that the environmental values are clearly identified and known within the project area. A series of fieldwork investigations have also been undertaken to validate desktop selection.

2.3 Context, planning framework and state/local government requirements
Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (eg. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

Arrow currently holds five Environmental Authorities (EAs) for the petroleum tenements associated with the Dalby Expansion Project (PLs 194, 198, 230, 238 and 252). In addition, Arrow has applied for environmental authorities for PL(A)s 258 and 260.

2.4 Environmental impact assessments under Commonwealth, state or territory legislation
If you have identified that the proposed action will be or has been subject to a state or territory environmental impact statement (in section 1.10) you must complete this section. Describe any environmental assessment of the relevant impacts of the project that has been, is being, or will be carried out under state or territory legislation. Specify the type and nature of the assessment, the relevant legislation and the current status of any assessments or approvals. Where possible, provide contact details for the state/territory assessment contact officer.
Describe or summarise any public consultation undertaken, or to be undertaken, during the assessment. Attach copies of relevant assessment documentation and outcomes of public consultations (if available).

An environmental authority is required for development of petroleum tenements granted and regulated under the *Petroleum and Gas (Production and Safety) Act 2004* (Qld). Exploration activities are currently being undertaken within the project development area under existing approvals. The exploration activities have already been approved and are not included in this referral. Dalby Expansion Project activities are level 1 petroleum activities for which an environmental authority under the *Environment Protection Act 1994* (Qld) is required. Environmental authorities are granted by the Queensland Department of Environment and Resources Management (DERM) and are the primary statutory documents used by DERM in its regulatory role to ensure environmental compliance of the project.

Dalby Expansion Project activities will be assessed and approved by amendment (and consolidation) of existing environmental authorities held by Arrow for the nominated petroleum tenements. An Environmental Management Plan (EM Plan) prepared by Arrow provides the information required by DERM to assess the application to amend (and consolidate) the environmental authorities into a project environmental authority.

2.5 Consultation with Indigenous stakeholders
Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral.

Cultural Heritage
Arrow is currently finalising a review of its records to better understand the nature and scope of cultural heritage surveys that have occurred to date over its existing tenements. This work should be completed in the near future.

Arrow anticipates commencing the process for development of a Cultural Heritage Management Plan (CHMP) as required to comply with the *Aboriginal Cultural Heritage Act 2003* (Qld) in the first quarter of 2010. The CHMP will involve extensive consultation with Aboriginal parties and contain management and mitigation measures for Aboriginal cultural heritage during exploration, construction and operation phases of the project.

Native Title
Arrow has completed a review of its tenements to identify an order of priority for its operations. It is intended that Future Act processes as outlined in the *Native Title Act 1993* (Cwlth) will be followed to obtain the necessary approvals for Future Acts that may have an impact on native title rights and interests.

Arrow will seek to utilise both the voluntary and statutory processes outlined in the legislation and intends to commence the process in the first quarter of 2010, which will involve extensive consultation with Native Title parties.

2.6 A staged development or component of a larger project
If you have identified that the proposed action is a component of a larger action (in section 1.11) you must complete this section. Provide information about the larger action and details of any interdependency between the stages/components and the larger action. You may also provide justification as to why you believe it is reasonable for the referred action to be

considered separately from the larger proposal (eg. the referred action is 'stand-alone' and viable in its own right, there are separate responsibilities for component actions or approvals have been split in a similar way at the state or local government levels).

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest.

Your assessment of likely impacts should refer to the following resources (available from the Department's web site):

- specific values of individual World Heritage properties and National Heritage places and the ecological character of Ramsar wetlands;
- profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;
- *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*; and
- associated sectoral and species policy statements available on the web site, as relevant.

Note that even if your proposal will not be taken in a World Heritage area, Ramsar wetland, Commonwealth marine area, or on Commonwealth land, it could still impact upon these areas (for example, through downstream impacts). Consideration of likely impacts should include both direct and indirect impacts.

The approach to field development will follow environmental procedures developed to minimise impacts on significant environmental values (both State and Commonwealth). As there are existing operations within the project area, the procedures currently used will be implemented for siting new infrastructure . EPBC Act matters of national environmental significance have high environmental value and therefore stringent criteria for field development will be in place to avoid or minimise impacts on these values.

3.1 (a) World Heritage Properties

Description

None present.

Nature and extent of likely impact

Address any impacts on the World Heritage values of any World Heritage property.

3.1 (b) National Heritage Places

Description

None present.

Nature and extent of likely impact

Address any impacts on the National Heritage values of any National Heritage place.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

The Dalby Expansion Project will be undertaken within the same catchment as the Narran Lake Nature Reserve, RAMSAR site. This site is located in the north west of NSW and is a significant site for water bird breeding (DEWHA 1999).

Nature and extent of likely impact

Address any impacts on the ecological character of any Ramsar wetlands.

The reserve covers part of a large terminal wetland of the Narran River at the end of the Condamine River (which flows from Queensland). The site is downstream of the project area and over 600 km to the southwest. There is a low likelihood of significant impacts on the nature reserve.

3.1 (d) Listed threatened species and ecological communities

Description

The EPBC Protected Matters search undertaken on 29 October 2009 identified 24 threatened species and 4 ecological communities as being potentially present within 5 km of the project area (Appendix 1). Threatened species included 6 birds, 3 mammals, 1 fish, 3 reptiles and 11 plants.

This list is based on the likelihood of occurrence according to distribution of species and their habitats from various government databases. To further assess if any additional EPBC Act listed species could potentially be present within the project area, both flora and fauna database searches were also undertaken.

For flora, the databases included DERM's Regional Ecosystem digital data, the Queensland Herbarium's HerbRecs database (extract August, 2009), DERM's WildNet database (which incorporates HerbRecs specimen data, CORVEG site data and may also include information from research and monitoring programs, inventory programs including extension activities, literature records, wildlife permit returns and community programs). An analysis of aerial photography of the area was also undertaken to assist in vegetation mapping. One flora species, *Bothriochloa biloba* (lobed blue grass) was identified through the DERM WildNet database and the Queensland Herbarium database as being recorded in the surrounding area. The species did not register in the EPBC Protected Matters Search. This species has been included in the assessment (resulting in a total of 12 plants).

For fauna, the information sources included Birds Australia Atlas database, DERM's WildNet database and specimen records held by the Queensland museum. One fauna species, *Dasyurus maculates* (spotted-tailed quoll) was identified through the WildNet database as being recorded in the project area, which did not register in the EPBC Protected Matters Search. This species has been included in the assessment (resulting in a total of 4 mammals).

Field surveys of the project area were undertaken in October and November 2009. The surveys targeted locating significant species and species habitat. Surveys also aimed to verify database and DERM's Regional Ecosystem mapping. A total of 85 flora sites were surveyed within the project area. The details of the searches and surveys are summarised below and provided in full in Appendix 2.

Table 3 shows the details of the EPBC Protected Matters search. The likelihood of occurrence was assessed using information from literature reviews and searches of additional databases and also from the October and November 2009 field surveys. Field surveys identified the brigalow ecological community, but failed to locate any EPBC Act listed flora or fauna species (excluding migratory species which are outlined in Section 3.1 (e)).

Table 3 Listed threatened species and ecological communities from EPBC Protected Matters Search and the likelihood of occurrence.

	Species	Status	Type of presence	Likelihood of occurrence
Ecological communities	Brigalow (*Acacia harpophylla* dominant and codominant)	Endangered	Community known to occur within area	***Present:*** This community has been identified within in the project area. The community encompasses RE's 11.9.5, 11.4.3 and 11.3.1 as well as a number of advanced regrowth brigalow communities.
	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area	***Unlikely:*** This community is unlikely to be present in the area. Queensland Regional Ecosystem mapping does not identify it as being present. Field surveys failed to locate the

				community.
	Weeping myall woodlands	Endangered	Community likely to occur within area	***Unlikely:*** This community is restricted to small patches that occur within two Regional Ecosystems in Queensland. These are 11.3.2 and 11.3.28. Only 11.3.2 is present within the project area however this is unlikely to support the weeping myall woodlands. Field surveys failed to locate the community.
	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	***Unlikely:*** This community is unlikely to be present in the area. Queensland Regional Ecosyste[redacted] mapping does not identify it as being present. Field surveys failed to locate the community.
Birds	*Anthochaera phrygia* Regent honeyeater	Endangered	Species or species habitat may occur within area	***Unlikely:*** The habitat for this species consists of dry eucalypt woodland and open forest, woodland, rural and urban areas with mature eucalypts; favours box-ironbark associations. The Regional Ecosystem mapping and field surveys indicate that there is limited habitat in the project area. Transient individua[redacted] from the south near Warwick have been recorded previously near the project area, however these are not permanent populations.
	Erthrottriorchis radiatus Red goshawk	Vulnerable	Species or species habitat likely to occur within area	***Unlikely:*** There is a record of the species from Lake Broadwater, however this is expected to be of a transient individual, not permanent populations. The present habitat is unlikely to be occupied by the species.

	Geophaps scripta scripta Squatter pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area	***Unlikely:*** There have been no previous database records within the project area. The species is predominantly found north of Millmerran.
	Lathamus discolor Swift parrot	Endangered	Species or species habitat may occur within area	***Unlikely:*** There have been no previous database records within the project area. The species is predominantly found south of Chinchilla.
	Neochmia ruficauda ruficauda Star finch (eastern), star finch (southern)	Endangered	Species or species habitat likely to occur within area	***Unlikely:*** There have been no previous database records within the project area. The species is predominantly found south of Chinchilla.
	Rostratula australis Australian painted snipe	Vulnerable	Species or species habitat may occur within area	***Possible***: The habitat within the project area that may support this species include waterbodies, particularly those with a mosaic of fringing vegetation and open mudflats. Suitable habitat is restricted to Lake Broadwater and the vicinity immediately north at Long Swamp. The Birds Australia and WildNet databases indicate that this species has been recorded in the vicinity of the project area.
Mammals	*Chalinolobus dwyeri* Large-eared pied bat, large pied bat	Vulnerable	Species or species habitat may occur within area	***Unlikely:*** This species is known to inhabit caves and overhangs and higher altitude moist tall open forest adjacent to rainforest. There is limited habitat in the project area.
	Dasyurus hallucatus Northern quoll	Endangered	Species or species habitat may occur within area	***Unlikely:*** The northern quoll lives in a range of open woodland and forests, with dens in rock crevices, tree holes or termite mounds. There is limited habitat in the project area.

	Nyctophilus timoriensis (South-eastern form) Greater long-eared bat	Vulnerable	Species or species habitat may occur within area	***Unlikely***: Preferred habitat includes dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (*Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris*), also vine thickets. There is limited habitat in the project area. Not located during the recent field surveys and no confirmed recorded species within the project area.
	Dasyurus maculatus Spotted-tailed quoll	Vulnerable	Species or species habitat may occur within area	***Unlikely***: Preferred habitat includes dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (*Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris*), also vine thickets. There is limited habitat in the project area. Not located during the recent field surveys.
Ray-finned fishes	*Maccullochella peelii peelii* Murray cod, cod, goodoo	Vulnerable	Species or species habitat may occur within area	***Likely:*** The watercourses within the Condamine River catchment could provide habitat for the species.

Reptiles	*Anomalopus mackayi* Five-clawed worm-skink, long-legged wormskink	Vulnerable	Species or species habitat may occur within area	***Possible***: The habitat within the project area may support this species. The species prefers low open grassland with scattered trees to open grassy dry Eucalyptus and Callitris forest/woodland. Regional Ecosystem 11.3.21 provides habitat for the species however this was not present within the project area. A draft recovery plan is being prepared for Brigalow Belt Reptiles which includes this species (WWF, 2008).
	Furina dunmalli Dunmall's snake	Vulnerable	Species or species habitat may occur within area	***Possible:*** The habitat within the project area may support this species. Historic records are known from Lake Broadwater. Most records occur in remnant vegetation including Brigalow, open woodland and even tall forests. They may occur in any woodland or forest vegetation types within the project area, but are probably absent from disturbed vegetation.
	Tympanocryptis pinguicolla Grassland earless dragon	Endangered	Species or species habitat may occur within area	***Possible:*** Regional Ecosystem 11.3.21 (this was not present within the project area) provides habitat for the species. It is predominantly found between Toowoomba and Cecil Plains, within grasslands, including those on roadside verges. No known records west of Wilkie Creek.
Plants	*Acacia chinchillensis* Chinchilla Wattle	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area (within Regional Ecosystem 11.5.1). Potential habitat

				includes flat to gently undulating plains within *Eucalyptus crebra, Callitris glaucophylla, Allocasuarina luehmannii* woodland to open forest. Targeted searches in suitable habitat failed to locate this species during field assessments. Potential to occur is low but still possible.
	Bothriochloa biloba Lobed blue grass	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area. Database records exist of the species within the project area (2 km south of the Condamine River a 10 km north of Cecil Plans on roadsides).
	Cadellia pentastylis Ooline	Vulnerable	Species or species habitat likely to occur within area	***Unlikely:*** No previous records in vicinity. Sub optimal habitat exists within the project area.
	Dichanthium queenslandicum King blue-grass	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area. Preferred habitat includes remnant and non-remnant derived grasslands on alluvium, cracking clays, and basalt. No previous records within the project area.
	Digitaria porrecta Finger panic grass	Endangered	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area. Preferred habitat includes non-remnant derived grasslands on alluvium and cracking clays, Brigalow/Belah, and Eucalypt woodlands on heavy alluvial soils. Targeted searches failed to locate this species during field assessments. There are existing HerbRecs records of the species within the project area.
	Diuris sheaffiana Tricolour diuris	Vulnerable	Species or species habitat may occur	***Unlikely:*** No records in the vicinity. Sub optimal habitat exists

			within area	optimal habitat exists within the Project Area. Preferred habitat includes grass eucalypt woodland and open forest including *Eucalyptus populnea, E. pilligaensis*, often with *Callitris* on sandy or lateritic and landforms.
	Homopholis belsonii	Vulnerable	Species or species habitat may occur within area	***Possible:*** Suitable habitat exists within the project area. There are existing HerbRecs records of the species 4km east of Dalby, in *Casuarina cristata* and *Acacia melvillei* vegetation on grey to black alluvial soils. Has potential to occur in *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forests on Cainozoic clay plains and regrowth types and may be associated with road reserves.
	Philotheca sporadica	Vulnerable	Species or species habitat likely to occur within area	***Likely:*** Suitable habitat exists within the project area. Preferred habitat includes rocky lateritic and sandstone rises and low ridges in mixed *Eucalypt/Callitris* woodlands including *Eucalyptus fibrosa* subsp. *nubila*, *E. crebra*, *E. exserta*, *Allocasuarina luehmannii*, *Callitris glaucophylla*, and *Corymbia trachyphloia*. Targeted searches failed to locate the species. However it has previously been recorded in the project area.
	Picris evae Hawkweed	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area. Preferred habitat includes eucalyptus open grassy woodland, *Dichanthium sericeum*

				grassland, and non-remnant roadsides, paddocks and cultivated areas. Targeted searches failed to locate the species. However it has previously records exist (30 km south east of the project area).
	Rhaponticum australe Austral cornflower, native thistle	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** No records in vicinity. Sub optimal habitat exists within the Project Area Preferred habitat includes eucalypt open forest with grassy understorey on roadsides and on road reserves, and *Eucalyptus tereticornis* and *Angophora floribunda* on black clay soil (BRI collection records, n.d.).
	Thesium australe Austral toadflax, toadflax	Vulnerable	Species or species habitat likely to occur within area	***Possible:*** Suitable habitat exists within the project area. There are previous database records within the project area. Preferred habitat includes roadside remnant and non-remnant grasslands and *Eucalyptus populnea* grassy woodlands on heavy soil alluvium.
	Tylophora linearis	Endangered	Species or species habitat may occur within area	***Unlikely:*** A known record is located at Glenmorgan, to the far west of the project area. Not likely to occur.

Nature and extent of likely impact

Address any impacts on the members of any listened threatened species or any threatened ecological community, or their habitat.

Ecological communities

3D Environmental (2009) has undertaken field surveys to confirm if the identified threatened communities are present or likely to be present in the project area. Of the four communities, the only community likely to be within the project area is the brigalow (*Acacia harpophylla* dominant and codominant), which was identified within PL 198, PL 252 and PL 260. Figure 5 shows the distribution of the community within the project area.

The proposed location of the Theten IPF and Duntroon IPF is provided in Figure 6 and 7 with the mapped brigalow community. The Theten IPF site has a small non-remnant area on the eastern boundary and to the north on Theten Road. Duntroon IPF site does not have any remnants present. The Lynwood North option in Figure 8 shows there are two small fragments of the EPBC community present. All proposed development activities are located some distance from these sites.

As the extent of brigalow is highly fragmented, with small patches located within the area, the proposed options for infrastructure locations have been designed to avoid disturbance. Final site selection will be refined in consultation with a suitably qualified ecologist to ensure avoidance of all fragments.

Appendix 2 contains the 3D Environmental (2009) report which provides a detailed assessment of the likelihood of impacts from the project.

The proposed well areas and the pipeline connection to sales gas infrastructure and the EPBC communities are shown on Figure 9. The actual well site locations can be strategically placed around sensitive environmental areas and the pipeline right of way can also be reduced or shifted to avoid impacts. Due to the fragmented nature of the brigalow within the project area, it will be feasible to avoid these locations. Details of measures to avoid impacts are provided in Section 4.

Arrow intends to avoid clearing of EPBC Act listed vegetation, wherever possible, and minimise clearance wherever unavoidable. Therefore, direct impacts to the community are considered to be minimal. There is potential for indirect impacts such as an increase in weeds. However, proposed measures to avoid or reduce impacts (see Section 4) minimise the potential for significant impacts.

Birds

The only EPBC Act bird species likely to be present within the project area is the *Rostratula australis* (Australian painted snipe). This species prefers habitat within waterbodies and open mudflats. Suitable habitat is uncommon in the project area, and restricted to Lake Broadwater and possibly Long Swamp (both within PL 260). Impacts could result from removal of habitat, noise and light disturbances. The extent of impacts to the threatened bird species are expected to be minor, specifically as no habitat for this species within Lake Broadwater or Long Swamp will be disturbed.

Mammals

There are no mammals with the potential to occur within the project area.

Ray-finned fishes

The *Maccullochella peelii peelii* (Murray Cod) has the potential to occur within the Condamine River catchment. Potential impacts could occur from a decrease in water quality, elevated turbidity, restriction to fish movements or degradation of habitat. It is not proposed (as part of the project) to restrict the flow in the Condamine River or tributaries, so direct impacts to the species are not expected.

The proposed development of infrastructure for the Theten and Duntroon IPF will not be placed within watercourses. However, potential impacts could occur from decreases in water quality from construction of wells and associated infrastructure in close proximity to watercourses. Proposed measures to avoid or reduce impacts are provided in Section 4.

Reptiles

Two reptile species could potentially occur within the project area. These include the *Anomalopus mackayi* (five-clawed worm-skink), *Furina dunmalli* (Dunmall's snake) and the *Tympanocryptis pinguicolla* (Grassland earless dragon). These species may be impacted through the removal of important habitat to allow for field development and construction of infrastructure.

Dunmall's snake prefers habitat near waterbodies (such as Lake Broadwater). The five-clawed worm-skink and grassland earless dragon prefer 'derived grassland' habitat. Development of infrastructure for the Theten and Duntroon IPF will not occur within watercourses or near waterbodies. However, some field development is likely to occur within derived grassland habitat.

Plants

Nine plant species have the potential to occur within the project area. These are:

- *Acacia chinchillensis* (Chinchilla Wattle).
- *Bothriochloa biloba* (Lobed Blue Grass).
- *Dichanthium queenslandicum* (King blue-grass).
- *Digitaria porrecta* (Finger panic grass).
- *Homopholis belsonii.*
- *Philotheca sporadica.*
- *Picris evae* (Hawkweed).
- *Rhaponticum australe*
- *Thesium australe* (Austral toadflax).

The proposed action could have an impact on threatened plant species from direct clearance for infrastructure or field development or from indirect impacts such as weed infestations.

3.1 (e) Listed migratory species

Description

The EPBC Protected Matters search identified 19 migratory species as being potentially present within 5 km of the project area (Appendix 1). The list is based on the likelihood of occurrence according to distribution of species and their habitats. Table 4 shows the details from the EPBC Protected Matters search and the likelihood of occurrence at the project area using information from literature reviews. Field surveys of the project area were undertaken in October and November 2009, which targeted locating significant species and species habitat.

The bulk of these species are wetland/water species (e.g., waders, sea eagles, egrets) whose distribution within the local area is likely to be restricted or heavily influenced by Lake Broadwater and potentially Long Swamp. Rarely will the species inhabit other areas in the project area.

Table 4 Listed migratory species from EPBC Protected Matters search and the likelihood of occurrence

	Species	Status	Type of presence	Likelihood of occurrence
Migratory Terrestrial Species – Birds	*Haliaeetus leucogaster* White-bellied sea-eagle	Migratory	Species or species habitat likely to occur within area	***Likely:*** The project area contains potential habitat for this species.
	Hirundapus caudacutus White-throated needletail	Migratory	Species or species habitat may occur within area	***Present:*** This species was recorded within the project area during field surveys. Common and widespread.
	Merops ornatus Rainbow bee-eater	Migratory	Species or species habitat may occur within area	***Present:*** This species was recorded within the project area during field surveys. Common and widespread.
	Rhipidura rufifrons Rufous fantail	Migratory	Breeding may occur within area	***Present:*** This species was recorded within the project area during field surveys. The species prefers wet forests, of which there are none in the project area. Transient individuals are present rather than permanent populations.

	Xanthomyza phrygia Regent honeyeater	Migratory	Species or species habitat may occur within area	***Unlikely:*** The habitat for this species consists of dry eucalypt woodland and open forest, woodland, rural and urban areas with mature eucalypts; favours box-ironbark associations. The Regional Ecosystem mapping and field surveys indicate that there is limited habitat in the project area. Transient individuals from the south near Warwick have been recorded previously near the project area, however these are not permanent populations.
Migratory Wetland Species – Birds	*Ardea alba* Great egret, white egret (also the eastern great egret)	Migratory	Species or species habitat may occur within area	***Present*:** This species was recorded within the project area during field surveys. Present within nearby waterbodies in the project area.
	Ardea ibis Cattle egret	Migratory	Species or species habitat may occur within area	***Possible*:** The habitat within the project area may support the species. It could potentially be present within nearby waterbodies in the project area.
	Gallinago hardwickii Latham's snipe, Japanese snipe	Migratory	Species or species habitat known to occur within area	***Possible*:** This is a coastal species. It could potentially be present within nearby waterbodies in the project area.
	Nettapus coromandelianus albipennis Australian cotton pygmy-goose	Migratory	Species or species habitat may occur within area	***Possible*:** There are suitable freshwater waterbodies within the project area to support the species. There have previously been records in the general area.

	Limosa limosa Black-tailed godwit	Migratory	Species or species habitat known to occur within area	***Possible:*** There are suitable freshwater waterbodies within the area to support the species. There have previously been records in the general area.
	Nettapus coromandelianus albipennis Australian cotton pygmy-goose	Migratory	Species or species habitat may occur within area	***Possible:*** There is suitable habitat within the project area.
	Rostratula benghalensis s. lat. Painted snipe	Migratory	Species or species habitat may occur within area	***Possible:*** There is suitable habitat within the project area.
	Tringa glareola Wood sandpiper	Migratory	Species or species habitat known to occur within area	***Possible:*** There is suitable habitat within the project area.
	Tringa nebularia Common greenshank, greenshank	Migratory	Species or species habitat known to occur within area	***Possible:*** There is suitable habitat within the project area.
	Tringa stagnatilis Marsh sandpiper, little greenshank	Migratory	Species or species habitat known to occur within area	***Possible:*** There is suitable habitat within the project area.
Migratory Marine Birds	*Apus pacificus* Fork-tailed swift	Migratory	Species or species habitat may occur within area	***Possible:*** This species may migrate through the site to other areas of potential habitat.
	Ardea alba Great egret, white egret	Migratory	Species or species habitat may occur within area	***Possible:*** This is a coastal species. It could potentially be present within nearby waterbodies.
	Ardea ibis Cattle egret	Migratory	Species or species habitat may occur within area	***Possible:*** The habitat within the project area may support the species.

Nature and extent of likely impact

Address any impacts on the members of any listed migratory species, or their habitat.

Migratory Terrestrial Species - Birds
The project is unlikely to have a significant impact on threatened migratory terrestrial bird species, as many of these migrate through or fly over the area rather than inhabit the project area on a long term basis.

Migratory Wetland Species – Birds
Migratory wetland species may visit Lake Broadwater and Long Swamp. The proposed development will not impact on the waterbodies or their immediate surrounds, therefore significant impacts to these species are unlikely.

Migratory Marine Birds
These species may fly over the project area. Significant impacts from the project are unlikely.

3.1 (f) Commonwealth marine area
(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area, that may have impacts on that area.)

Description

None present.

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth marine area.

3.1 (g) Commonwealth land
(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land, that may have impacts on that land.)

Description
If the action will affect Commonwealth land also describe the more general environment. The Policy Statement titled *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* provides further details on the type of information needed. If applicable, identify any potential impacts from actions taken outside the Australian jurisdiction on the environment in a Commonwealth Heritage Place overseas.

None present.

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth land. Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:
- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and the social, economic and cultural aspects of the above things.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, or actions taken on Commonwealth land

You must describe the nature and extent of likely impacts (both direct & indirect) on the whole environment if your project:

- is a nuclear action;
- will be taken by the Commonwealth or a Commonwealth agency;
- will be taken in a Commonwealth marine area; or
- will be taken on Commonwealth land.

Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.2 (a)	**Is the proposed action a nuclear action?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))

3.3 Other important features of the environment

Provide a description of the following features of the project area and the affected area, to the extent not otherwise addressed above.

3.3 (a) Soil and vegetation characteristics

Soils in the project area are dominated by heavy clays, which form rich agricultural soils. These are characterised by self-mulching, cracking clays with a deep profile. The richness of these soils resulted in clearance of the original dense woodland for agriculture. Agricultural practices include irrigation, cropping and cattle grazing. Many paddocks have been laser-levelled to achieve efficient flood irrigation. Soil erosion occurs within the disturbed clay soils, where suitable land management practices have not been adopted. In some areas, deep incised ephemeral channels have formed.

The project area falls within the Brigalow Belt bioregion. This bioregion is characterised by dense woodland and forest communities of Brigalow (*Acacia harpophylla*), with scattered ecosystems dominated by other species including eucalypt and cypress pine, grasslands and other acacia species. Expansive areas of land have been cleared in the region for agricultural purposes. Some tracts of remnant vegetation still exist as intact patches and isolated stands including along riparian systems associated with the Condamine river and tributaries. Figure 10 shows the distribution of Queensland Regional Ecosystems within the project area.

Other large tracts of vegetation include the vegetation within the Barakula State Forest north of Chinchilla (also used as a working forest), and the Braemar and Kumbarilla state forests bordering the project area, west and southwest of Dalby.

3.3 (b) Water flows, including rivers, creeks and impoundments

The Dalby Expansion Project lies within the sub-catchments of the Condamine River as listed below:

- Condamine River.
- Cooranga Creek.
- Braemar Creek.
- Back Creek.
- Jingi Jingi Creek.
- Jimbour Creek.
- Wilkie Creek.
- Moramby Creek.
- Clayhole Creek.
- Myall Creek.
- Oakey Creek.
- Crawlers Creek.
- Kurrawa Creek.
- Willis Creek.
- Ashall Creek.

The Condamine River and its major tributary, Wilkie Creek traverse the project area. Lake Broadwater and Long Swamp are also located within the project area.

Water quality data maintained by the Queensland Department of Environment and Resource Management (DERM) was available for Condamine River, Oakey Creek and Jimbour Creek in the vicinity of the Dalby Expansion Project. The data was reviewed in combination with field survey water quality results to determine the environmental values of the water.

The environmental values considered most appropriate for waters in the Dalby Expansion Project area are:

- Slightly-moderately disturbed waters (creeks and rivers were observed during the field survey to be affected by human activity due to land uses upstream of sites, although sites did not appear sufficiently degraded to consider them highly disturbed waters).

- Domestic water supply.
- Primary industry and agricultural land uses (dominant in the region).

Potential impacts to surface water from project activities have been assessed during preparation of the EM Plan, which is assessed by the Queensland Department of Environment and Resource Management.

3.3 (c) Outstanding natural features, including caves

No outstanding natural features.

3.3 (d) Gradient (or depth range if action to be taken in a marine area)

The gradient within the project area is variable. The minimum elevation is located approximately 320 m AHD within the northern end of the Dalby Expansion Project area, in the vicinity of the Condamine River. The maximum elevation is approximately 440 m ADH located on the edge of the Kumbarilla State Forest approximately 10 km west of Cecil Plains township.

3.3 (e) Buildings or other infrastructure

Various infrastructure is located on the existing PLs and PL(A)s, however none of these hold any significance historically.

Historical sites of significance within the region include the Dalby War Memorial and Memorial Park, which are located within the town of Dalby. Project activities will not impact on this feature.

3.3 (f) Marine areas

There are no marine areas within the vicinity of the project area.

3.3 (g) Kinds of fauna & flora

Significant tracts of fauna habitat occur around the western edges of the project area, southwest of Millmerran, and northeast of Miles. The pattern of habitat mirrors those areas recognised as being of bioregional significance and include wildlife corridors. A major wildlife corridor exists along the riparian margins of the Condamine River.

A total of 257 vascular flora species were recorded during the 2009 field survey including two ferns, two gymnosperms and 253 flowering plants. Preliminary mapping of habitat for significant species has been undertaken and is provided in Appendix 2.

A total of 132 vertebrate species were observed during the survey including one frog, 17 reptiles, 103 birds and 11 mammals. A list of species recorded during the survey is provided in Appendix 2.

3.3 (h) Current state of the environment in the area

Include information about the extent of erosion, whether the area is infested with weeds or feral animals and whether the area is covered by native vegetation or crops.

The project area is centred around the broad alluvial plain of the Condamine River and its associated tributaries. The productivity of the alluvial clay soils on the flood plain has resulted in heavy utilisation of these areas for agricultural purposes (predominantly tilled cropping) and remnant vegetation is largely restricted to narrow discontinuous strips along roadsides and drainage lines, or as isolated fragments on soils of less favourable physical properties. Continuous tracts of remnant vegetation associated with Braemar and Kumbarilla State Forests to the west intrude into the project area notably near PL 198 and the western edge of PL 230.

Four weeds declared under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002*, were observed in the project area during field surveys. These were *Opuntia stricta* (prickly pear), *Opuntia tomentosa* (velvet pear), *Harrisia martini* (harrisia cactus) and *Bryophyllum delagoensis* (mother of millions).

Fifteen exotic vertebrate species are known to occur within the project area. Many of these pests (cane toad, house mouse, rock dove, common mynah) are abundant.

3.3 (i) Other important or unique values of the environment

Describe any other key features of the environment affected by, or in proximity to the proposed action (for example, any national parks, conservation reserves, wetlands of national significance etc).

The following parks and forests (see Figure 11) are located within the project area:

- Dalby State Forest within PL 194.
- Condamine Park (Karana) is located within PL(A) 260.
- Lake Broadwater Conservation Park within PL(A) 260 and PL 198. This site has been identified as possessing ecological values of state significance relating to special biodiversity values (wildlife refugia). The site is habitat for two rare flora species listed on the *Nature Conservation Act 1992,* and is listed as a 'Nationally Important Wetland' (Environment Australia, 2001).
- Braemar State Forest on the boundary of PL 230.

The following state forests are located outside of the project area:

- Daandine State Forest.
- Kumbarilla State Forest.
- Dunmore State Forest.
- Waar Waar State Forest.
- Western Creek State Forest.
- Wondul Range National Park.
- Bulli State Forest.

3.3 (j) Tenure of the action area (eg freehold, leasehold)

The land within the project area is predominantly freehold with some reserves (conservation reserve and National park).

3.3 (k) Existing land/marine uses of area

The Dalby Expansion Project area is surrounded by existing petroleum operations and exploration activities. Agricultural practices are also undertaken, which include irrigation, cropping and cattle grazing.

3.3 (l) Any proposed land/marine uses of area

The proposed use of the land is for gas field development and infrastructure, as detailed in Section 2.

4 Measures to avoid or reduce impacts

The Australian Government Environment Minister may decide that a proposed action is not likely to have significant impacts on a protected matter, as long as the action is taken in a particular manner (section 77A of the EPBC Act). The particular manner of taking the action may avoid or reduce certain impacts, in such a way that those impacts will not be 'significant'. More detail is provided in the *Guideline on Particular Manner Decisions under the EPBC Act* available at the Department's web site.

For the Minister to make such a decision (under section 77A), the proposed measures to avoid or reduce impacts must:

- clearly form part of the referred action (eg be identified in the referral and fall within the responsibility of the person proposing to take the action),
- be must be clear, unambiguous, and provide certainty in relation to reducing or avoiding impacts on the matters protected, and
- must be realistic and practical in terms of reporting, auditing and enforcement.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of habitat important, specific design measures, or adoption of specific work practices.

More general commitments (eg preparation of management plans or monitoring) and measures aimed at providing environmental offsets, compensation or off-site benefits CANNOT be taken into account in making the intial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages if your proposal proceeds to these stages.) Refer to the Guideline on Particular Manner Decisions under the EPBC Act available at the Department's web site.

For any measures intended to avoid or mitigate significant impacts on matters protected under the EPBC Act, specify:

- what the measure is,
- how the measure is expected to be effective, and
- the timeframe or workplan for the measure.

To ensure an understanding of EPBC Act listed communities and to provide accurate mapping, 3D Environmental (2009) undertook field surveys of the project area. Appendix 2 contains the report which provides a detailed assessment of the likelihood of impacts from the project.

The proposed action by Arrow to continue coal seam gas development in the Surat Basin by expansion of existing facilities and associated infrastructure will not have a significant impact on threatened communities and species listed under the EPBC (including migratory birds).

It is not proposed to clear any Brigalow communities for the Dalby Expansion Project.

Site Selection

Site selection has been the primary mitigation for avoiding and reducing impacts on EPBC Act listed threatened communities and species.

The project area contains many suitable development sites that avoid large remnants of native vegetation and therefore avoid adverse impacts to significant species. Infrastructure locations have been selected to avoid EPBC Act listed communities. Figures 6, 7 and 8 show the existing EPBC act listed communities and the proposed locations of infrastructure at the Theten IPF, Duntroon IPF and Lynwood North IPF sites.

Field development site selection is dependant upon the geological properties of the underlying strata, and ongoing collection of gas reservoir data. The proposed well site areas are shown in Figure 9. There are six key well development areas, each of which is proposed to contain approximately 50 wells. Most of these well site areas are in locations that have no EPBC Act listed communities mapped and very little native vegetation. The well development areas within PL 252 and PL 260 are the only sites with the brigalow community in the vicinity. There are two well site areas in the north (PL 194) and south (PL 258) which fall within areas of remnant native vegetation (not EPBC Act communities). The well site areas in PL 252 and PL 260 do contain brigalow, however it will be possible to avoid these locations.

Although the geology restricts the location of the wells to some extent, spacing between wells will ideally range from 700 m to 1000 m, hence there is scope to reposition proposed well sites to avoid sensitive areas at the surface. The maximum disturbance area for each new well site will be approximately 60 m by 70 m, this will be reduced to approximately 10 m by 10 m when the well is completed. Prompt rehabilitation after construction will also be undertaken.

The proposed high pressure gas pipeline connecting proposed facilities to sales gas infrastructure also falls within areas of remnant native vegetation and within the vicinity of mapped EPBC Act listed communities. The pipeline right of way width can be reduced or the alignment slightly shifted (where possible) to avoid such impacts.

The gas pipeline to sales infrastructure (Figure 9) alignment runs within close proximity to patches of brigalow in five locations. These locations are highlighted on the figure as locations 1 through to 5. Avoidance of these locations will be achievable by undertaking the measures discussed below:

- Location 1 – the alignment passes to the immediate east of a small patch of brigalow. The right of way will be reduced in width in this vicinity to avoid impacting on this area.
- Location 2 – the alignment passes to the immediate west of this small regrowth brigalow community. There is sufficient distance to avoid the patch at this location.
- Location 3 – the alignment passes to the immediate west of a small area of remnant brigalow. The right of way will be reduced in width in this vicinity to avoid impacting on this area.
- Location 4 – the alignment passes to the immediate east of a small patch of regrowth brigalow. There is sufficient distance to avoid the patch.
- Location 5 – the alignment passes within 80 m of a remnant patch of brigalow. A reduced width right of way and a 'no go' buffer zone will be established around this community to avoid adverse impacts.

Final site selection will be refined in consultation with a suitably qualified ecologist to ensure avoidance of all fragments.

Adherence to detailed site selection procedures and environmental management plans for construction and operation will ensure sensitive sites are protected and that appropriate measures are in place. Procedures will involve site selection criteria dependent upon the environmental conditions, and a set of minimum acceptable standards will be applied across all sites and facilities. Sites with moderate or high environmental constraints will have significantly higher environmental management requirements. This will be managed with a set of environmental management standard operating procedures (provided within the Appendices 3 – 7), to be held at an Arrow corporate level and implemented at sites. Accurate vegetation mapping over areas subject to immediate potential impact will be undertaken at a scale suitable for site specific planning prior to any development.

Once gas reserves within an area are proven viable, and a well site location (and gas and water gathering lines and access tracks) are finalised, the site will be assessed as to whether the location is ideal and has the lowest possible impact on the environment. The following aspects will be assessed and the site moved to a more suitable location if possible.

- Whether the site is within previous clearings or non-remnant vegetation or along existing easements.
- If the location has an adequate buffer distance to remnant vegetation or natural wetlands or watercourses (using the generic recommendations made the 'Regional Vegetation Management Code for Brigalow Belt and New England Tableland (DNR&W, 2006)). Specifically clearance will not occur within 100 m of any natural wetland (Long Swamp) within 200 m of any natural significant wetland (Lake Broadwater), other than clearing for pipelines and access tracks.
- Whether innovative solutions such as non-linear corridors (i.e. curves and bends around patches) can be used.
- Whether the track location can avoid the repeated isolating of small parcels of remnant vegetation from more continuous tracts.

- Whether methods to avoid high density well siting (e.g., horizontal drilling) can be used.

Once a location has been finalised, pre-construction/ pre-clearing surveys in habitats with potential for EPBC Act listed flora or fauna species within the vicinity of disturbance areas will be undertaken. The procedures for well site location are continually refined to ensure all environmental and social constraints are considered.

Additional Mitigation Measures

As detailed above, disturbance to populations of EPBC Act flora and fauna habitat will be avoided, by careful consideration to infrastructure site selection, field development and pipeline alignment. In addition to avoidance measures, mitigation measures are also proposed to reduce potential indirect adverse impacts. Environmental management standard operating procedures (SOPs) have been developed which outline the environmental protection objectives, responsibilities and procedures to avoid and minimize impacts to the various aspects of the environment. The relevant SOPs for matters of national environmental significance are:

- SOP Vegetation and Habitat (Appendix 3)
- SOP Ground Disturbance and Erosion (Appendix 4)
- SOP Weed and Pathogen (Appendix 5)
- SOP Wildlife and Stock (Appendix 6)
- SOP Rehabilitation (Appendix 7)

Flora

Vegetation disturbance will be minimised wherever possible. Well gathering corridors will be as narrow as possible, particularly when crossing linear corridors of vegetation (e.g. Condamine, Wilkie Creek and some roadside reserves). Well sites will also be as small as possible (with consideration to safety measures). Unintended clearance will be avoided by:

- Using appropriate buffer zones.
- Ensuring all workers including contract plant and machinery operators are aware of the location of significant remnant vegetation and are guided by qualified personnel when clearing is undertaken.
- Marking all disturbance areas on the ground prior to clearing to ensure unnecessary or unintended impact is avoided.

Edge effects on native vegetation will be reduced by retaining woody debris, logs and rocks for rehabilitation and piling the items along the edge of the cleared corridor, where possible. This will also provide refugia for crossing fauna.

To reduce weed spread, all machinery involved in clearing vegetation and trench construction (including light vehicles) will be thoroughly washed prior to site access.

Fauna

Capture of terrestrial animals in open trenches poses a potential impact to both common and EPBC Act listed species. Several strategies will be used to avoid these impacts including:

- Minimising the time trenches are open. Laying and burying of pipes to occur as soon as possible after the trench has been created.
- Construction of exit points along the trench when it passes through or is within 1 km of native vegetation. Exit points will be created by digging a sloped ramp approximately 0.5-1 m wide from the bottom of the trench to the surface. Trapped animals (e.g. wallabies, bettongs) may use these to exit the trench.
- Trenches will be checked and trapped frogs, lizards, snakes, mammals (e.g.) and removed on a daily basis prior to laying pipes and closing trenches (i.e. shortly after sunrise). Captured animals will be relocated to nearby vegetation.

- Machinery operators will be advised to keep vigilant watch for any injured vertebrates (including snakes and lizards) resulting from clearing activities. Injured wildlife will then receive veterinarian treatment.
- Sediment controls and buffer zones will be implemented when working near watercourses to avoid or reduce impacts to water quality and fish.

5 Conclusion on the likelihood of significant impacts

Identify whether or not you believe the action is a controlled action (ie. whether you think that significant impacts on the matters protected under Part 3 of the EPBC Act are likely) and the reasons why.

5.1 Do you THINK your proposed action is a controlled action?

X	No, complete section 5.2
	Yes, complete section 5.3

5.2 Proposed action IS NOT a controlled action.

Specify the key reasons why you think the proposed action is NOT LIKELY to have significant adverse impacts on a matter protected under the EPBC Act.

The proposed action by Arrow to continue coal seam gas development in the Surat Basin by expansion of existing facilities and associated infrastructure will not have a significant impact on threatened communities and species (including migratory birds) listed under the EPBC Act because it will not:

- **Lead to a long-term decrease in the size of a population.** Proposed mitigation measures will avoid or minimise impacts on known EPBC Act listed species and habitat or listed species with the potential to occur in remnant vegetation. The proposed activities will not lead to a long-term decrease in population sizes of the identified species.
- **Fragment an existing population into two or more populations.** Although construction of coal seam gas production infrastructure and access tracks through remnant vegetation may result in segmenting intact stands, the extent of disturbance, limited by the application of stringent environmental controls, is unlikely to cause fragmentation of existing populations.
- **Adversely affect habitat critical to the survival of a species.** The extent of vegetation to be cleared to construct and operate the project will not adversely affect critical habitat for the survival of known species and species that might occur in the area. Site selection processes for field development will result in the avoidance or minimisation of unnecessary vegetation clearance.
- **Disrupt the breeding cycle of a known population.** The proposed activities will not affect any known nesting roosts or areas of species found or with the potential to occur in the project area. Water bodies will not be affected by the proposed development activities.
- **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.** Some potential habitat (such as grassland) for both flora and fauna species will be affected by the proposed activities but not to the extent that the disturbance would significantly reduce the amount of remnant vegetation leading to a likely decline in its extent and quality or a decline in fauna abundance.
- **Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.** Weed management measures will ensure the introduction and spread of weeds is controlled.
- **Interfere with the recovery of a species.** The proposed site selection process and field development procedures, in addition to proposed mitigation measures will avoid or minimise impacts on listed threatened species and communities known or likely to occur in the project area and hence do not exacerbate the threatening processes.

5.3 Proposed action IS a controlled action

Type 'x' in the box for the matter(s) protected under the EPBC Act that you think are likely to be adversely impacted. (The 'sections' identified below are the relevant sections of the EPBC Act.)

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

Specify the key reasons why you think the proposed action is likely to have a significant adverse impact on the matters identified above.

6 Environmental history of the responsible party

NOTE: If a decision is made that a proposal needs approval under the EPBC Act, the Environment Minister will also decide the assessment approach. The EPBC Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach.

		Yes	No
6.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** Arrow Energy operates in a manner that protects and promotes the health and well-being of the environment. The company has maintained a clean environmental record since its foundation in 2000.	X	
6.2	**Has the party taking the action ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?** **If yes, provide details**		X
6.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?** **If yes, provide details of environmental policy and planning framework** Arrow Energy has an Integrated Environmental Management System, which promotes continual improvement of environmental performance. Audits and self-assessments are undertaken to ensure compliance with this system.	X	
6.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)** Tipton Gas Field Gas Pipeline - A referral was submitted by Arrow Energy for a 145 km buried gas pipeline from the Tipton Gas Field to supply the town of Dalby, Oakley and Wambo in QLD. The referral reference is EPBC 2004/1797. The decision of the referral was a 'not controlled action' dated 19 October 2004. Surat to Gladstone Pipeline – this proposed high pressure gas pipeline will transport gas from near Kogan North in the Surat Basin to Gladstone on the Queensland coast. To be constructed and operated by Surat Gladstone Pipeline Pty Ltd (a wholly-owned subsidiary of Arrow Energy). An EPBC Act referral (2009/5029) has been submitted for the project which was declared a controlled action on 15 October 2009. Assessment on preliminary information was nominated as the appropriate level of assessment for potential significant impacts on listed threatened species and communities (Sections 18 and 18A). Surat Gas Project – Arrow Energy proposes to submit an EPBC Act referral for the Surat Gas Project concurrently with this referral for the Dalby Expansion Project.	X	

7 Information sources and attachments

(For the information provided above)

7.1 References

- List the references used in preparing the referral.
- Highlight documents that are available to the public, including web references if relevant.

3D Environmental in association with Osmotic Ecology. 2009. Ecological values within areas under existing environmental authority application; Arrow Energy Surat Gas Project.

Department of the Environment, Water, Heritage and the Arts (DEWHA). 1999. Information Sheet on RAMSAR Wetlands – Narran Lake Nature Reserve 53.

Department of Natural Resources and Water (DNR&W). 2006. Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregion. Queensland Government, Brisbane.

Environment Australia (2001). *A Directory of Important Wetlands in Australia, Third Edition.* Environment Australia, Canberra.

WWF. 2008. Draft Queensland Brigalow Belt Reptile Recovery Plan 2007-2011. Report to the Department of the Environment and Heritage, Canberra. Australia.

7.2 Reliability and date of information

For information in section 3 specify:

- source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

7.3 Attachments

Indicate the documents you have attached. All attachments must be less than two megabytes (2mb) so they can be published on the Department's website. Attachments larger than two megabytes (2mb) may delay the processing of your referral.

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Figure 1 – Dalby expansion project development areas.
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Figure 2 – Current field development information. Figure 3 –Proposed additional field development. Figure 4 –Arrow Energy Surat Gas and Dalby Expansion Project areas. Figure 5 – EPBC Act listed ecological communities: Dalby Expansion Project. Figure 6 - EPBC Act listed ecological communities: Proposed Theten facilities. Figure 7 - EPBC Act listed ecological communities: Proposed Duntroon facilities.

			Figure 8 - EPBC Act listed ecological communities: Proposed Lynwood North (option) facilities. Figure 9 - EPBC Act listed ecological communities: Proposed connection pipeline and well areas. Figure 10 – Regional Ecosystems: Dalby Expansion Project. Figure 11 – Parks and Forests.
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.3)		
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.4)		
	copies of any flora and fauna investigations and surveys (section 3)	✓	Appendix 2
	technical reports relevant to the assessment of impacts on protected matters and that support the arguments and conclusions in the referral (section 3 and 4)	✓	Appendix 2 Appendix 3 Appendix 4 Appendix 5 Appendix 6 Appendix 7
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

8 Contacts, signatures and declarations

NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (s 489, EPBC Act).

Under the EPBC Act a referral can only be made by:

- the person proposing to take the action (which can include a person acting on their behalf); or
- a Commonwealth, state or territory government, or agency that is aware of a proposal by a person to take an action, and that has administrative responsibilities relating to the action[1].

Project title:

8.1 Person proposing to take action

This is the individual, government agency or company that will be principally responsible for, or who will carry out, the proposed action.

If the proposed action will be taken under a contract or other arrangement, this is:

- the person for whose benefit the action will be taken; or
- the person who procured the contract or other arrangement and who will have principal control and responsibility for the taking of the proposed action.

The Minister may also request relevant additional information from this person.

If further assessment and approval for the action is required, any approval which may be granted will be issued to the person proposing to take the action. This person will be responsible for complying with any conditions attached to the approval.

If the Minister decides that further assessment and approval is required, the Minister must designate a person as a proponent of the action. The proponent is responsible for meeting the requirements of the EPBC Act during the assessment process. The proponent will generally be the person proposing to take the action[2].

Name	s. 47F(1)
Title	Environment Manager
Organisation	Arrow Energy
ACN / ABN (if applicable)	73 078 521 936
Postal address	Level 19, AM60 42-60 Albert Street Brisbane Qld 4000 AUSTRALIA
Telephone	s. 47F(1)
Email	s. 47F(1)@arrowenergy.com.au
Declaration	I declare that the information contained in this form is, to my knowledge, true and not misleading. I agree to be the proponent for this action.
Signature	s. 47F(1) Date 27/1/10

[1] *If the proposed action is to be taken by a Commonwealth, state or territory government or agency, section 8.1 of this form should be completed. However, if the government or agency is aware of, and has administrative responsibilities relating to, a proposed action that is to be taken by another person which has not otherwise been referred, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

[2] *If a person other than the person proposing to take action is to be nominated as the proponent, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

8.2 Person preparing the referral information (if different from 8.1)

Individual or organisation who has prepared the information contained in this referral form.

Name	s. 47F(1)
Title	Senior Consultant
Organisation	Coffey Natural Systems
Postal address	Level 21, 12 Creek Street Brisbane, QLD 4000
Telephone	s. 47F(1)
Email	s. 47F(1) @coffey.com
Declaration	I declare that the information contained in this form is, to my knowledge, true and not misleading.
Signature	s. 47F(1) Date 27/1/10

If the referring party is a small business (fewer than 20 employees), estimate the time taken, in hours and minutes, to complete this form (include your time reading the instructions, working on the questions and obtaining the information and time spent by all employees in collecting and providing this information).

Hours	Minutes

SOP

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ENVIRONMENTAL MANAGEMENT SOP VEGETATION AND HABITAT

SOP: 99-V-SOP-0007
REV: A
STATUS: Draft
Review Date: <date>
DOC OWNER: Environment Manager

Purpose

Vegetation clearance will be conducted during the life cycle of Arrow's project activities, particularly during drilling preparation and construction work phases. Habitats associated with this vegetation have the potential to be negatively impacted due to attrition, fragmentation and dissection. In conjunction, permanent infrastructure may alter the existing wildlife habitats, through the attraction of wildlife to permanent infrastructure (e.g. associated water dams).

The purpose of this document is to manage the clearance of vegetation and potential loss / deterioration of the ecological value of land in the vicinity.

Environmental Protection Objectives:

Vegetation management during the life cycle of the project aims to preserve ecological biodiversity whilst maintaining safe and secure operation of the infrastructure. The management methods described in this plan are designed to minimise impact on retained vegetation and in some instances, promote species diversity.

The objectives of wildlife and vegetation management are:

- Avoid areas containing vegetation and habitat with environmental values that require protection:
  - Category A Environmental Sensitive Areas (ESAs).
  - Category B ESAs.
  - Areas containing endangered, venerable and rare (EVR) flora species and the habitat of EVR fauna.
  - Environment Protection and Biodiversity Conservation (EPBC) vegetation communities.
  - Vegetation Management Act (VMA) significant vegetation communities.
- Minimise habitat fragmentation and edge effects.
- Protect existing wildlife habitats.
- Minimise any impacts to wildlife due to the introduction of permanent infrastructure that may form alternative habitats.

Responsibilities

Title	Responsibilities
Chief Executive Officer	The Chief Executive Officer is responsible for ensuring that systems and resources are in place to adequately manage vegetation and habitat affected through the life cycle of the project.
Engineering Manager	Responsible for ensuring that vegetation and habitat issues are adequately addressed through site selection, site design and equipment selection.

Title	Responsibilities
Field / Facility Managers	Field and Facility Managers are responsible for ensuring that adequate resources and equipment are available during any works that have the potential to impact on vegetation and habitat. They are responsible for ensuring that environmental management requirements are implemented locally.
Field / Facility Personnel	Responsible for allocating specific responsibilities associated with management of vegetation and habitat to specific named individuals. Allocated responsibilities must include but need not be limited to: ▪ Inspections of areas outside work areas to ensure vegetation and associated habitats are undisturbed. ▪ Maintenance and inspection of work are barricades. ▪ Conduct inspections during scheduled vegetation removal events to ensure compliance.

Management Requirements

Standard procedures are set out below. Any site specific or more detailed environmental management requirements, procedures or plans are detailed in Schedule 1, attached.

Preparation and Planning

Prior to undertaking petroleum activities, determine the well and infrastructure configuration that will minimise the area of vegetation removal required, and minimise impacts to environmentally sensitive areas as per the **Environmental Management SOP - Site Selection**.

Conduct pre-construction/pre-clearing surveys in habitats known or which have the potential for EVR flora species in order to identify the location of all EPBC and NCA significant species within the vicinity of disturbance areas.

Surveys for target species to occur in optimum times (e.g. in the window following rainfall to allow growth of fertile material for identification).

Implement environmental protection zones in close proximity to clearing zones for any populations or EVR habitat by fencing and signage.

Prior to carrying out field based activities, all personnel will be made aware of the location of any environmentally sensitive areas within area of the proposed activity.

All personnel responsible for operating machinery must be made aware of the requirements of this SOP, and inducted into the site specific requirements regarding environmentally sensitive areas in the vicinity of the work area.

Demonstrate that the area disturbed by any construction is as low as reasonably practicable, and any decision to clear or disturb vegetation is based upon health and safety requirements and environmental considerations associated with the proposed drilling operations.

Disturbance of vegetation for construction of a production well must not exceed:

- 10,000 m^2 in previously significantly disturbed areas (i.e. cleared agricultural lands); or
- 6400 m^2 in areas of remnant vegetation (i.e. areas of "Not of Concern" Regional Ecosystems); and

- 3600 m^2 in areas of remnant vegetation that has been identified as having a high conservation value by the Administering Authority (e.g. areas "Of Concern" and "Endangered" Regional Ecosystems).

Removal of vegetation must be conducted in accordance with **Environmental Management SOP - Ground Disturbance and Erosion** and the **Environmental Management SOP - Weed and Pathogen**.

All relevant permits and approvals must be in place prior to commencement of vegetation removal activities.

Vegetation Removal

No unauthorised clearing of vegetation.

Vegetation must not be cleared:

- In or within 200 metres from any referrable wetland.
- In or within 50 metres of the high bank of any other watercourse.
- In a way that isolates clumps or dissects corridors of vegetation resulting in a reduction in the current level of ecosystem functioning, an increase in threatening processes, or the dissection of corridors of vegetation that provide connection between contiguous tracts of vegetation.
- In a way that damages adjacent live vegetation.
- On slopes greater than 10%.
- On dispersible soils.
- In existing or potential discharge areas.
- If it is identified as potentially having cultural heritage significance (e.g. scar tree).

Cleared vegetation must be stockpiled in a manner that facilitates respreading or salvaging and does not impede vehicle, stock or wildlife movements (refer to the **Environmental Management SOP - Wildlife and Stock)**.

Clearing of remnant vegetation for the purpose of establishing roads or tracks, shall not exceed 10 metres in width.

Where ever possible, vegetation will be removed at ground level by cutting / slashing (rather than removing root stock) and then stored for reuse as mulch during site rehabilitation, or sediment and erosion control.

Access of vehicles and personnel to areas outside the cleared work zone will be restricted so as to prevent further disturbance.

General Management Procedures for Environmentally Sensitive Areas

No work to be undertaken within Category A and Category B ESAs, or within disturbance exclusion zones determined:

- 1000m from a Category A ESA.
- 500m from a Category B ESA.

Generic recommendations made in the 'Regional Vegetation Management Code for Brigalow Belt and New England Tableland (DNR&W, 2006) require than no clearing be undertaken:

- within 100m of any natural wetland (e.g. Long Swamp)

- within 200m of any natural significant wetland (e.g. Lake Broadwater);
- within 50m of a stream of the 1st or 2nd order;
- within 100m of a stream of the 3rd or 4th order, and
- within 200m of a stream of the 5th order or greater.

Identify the location of all EPBC and VMA significant vegetation communities (Endangered and Of Concern) within the vicinity of disturbance areas and avoid these areas where alternative pathways are identified.

Avoid impact to all remnant and advanced regrowth vegetation.

Where the above buffer zones cannot be maintained, or sensitive areas can not be avoided, additional site specific constraints will be implemented, including (but not limited to) the following:

- Property scale vegetation mapping.
- Identification of whether this vegetation will trigger requirement for a vegetation management offset (VMO). Development of a VMO plan in consultation with DERM will be required where impacts to ecosystems requiring offsets are unavoidable.
- Consider translocation protocols identified in Vallee et al. (2004). Establish additional populations if necessary and feasible according to best practise principles. These include adherence to policy and permit requirements relevant to the removal of EVR flora species; liaison with relevant agencies and experts; commencement of translocation prior to construction into retention areas; prior seed collection and propagation to replace individuals that are destroyed as a result of construction or do not survive translocation programs.
- Utilise existing Recovery Plans and threatened species advice statements.

Management of Habitat Fragmentation and Edge Effects

Locate infrastructure within previous clearings or non-remnant vegetation, rather than areas with higher biodiversity values or through large undisturbed tracks of vegetation.

Locate wells along existing easements wherever possible.

Use non-linear corridors (i.e. curves and bends around patches) to minimise the impacts of reduced habitat area and fragmentation.

Linear collection and gathering infrastructure within large contiguous vegetation must be designed such that it minimises dissection of the vegetation. Track location must avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts.

Habitat Management

Avoid disturbance to habitats known to support significant flora species wherever possible in particular palustrine wetlands and derived grassland habitats on alluvial clay soils.

Woody debris, logs and rocks will be retained for rehabilitation. This material must be piled along the edge of the cleared corridor or spread across the full width of the corridor as they will provide refugia for crossing fauna. Systematic removal of surface debris must be avoided.

Trees will be visually inspected prior to clearing to ensure they are free of koalas. If koalas are located, the tree should be retained overnight. Vegetation surrounding the tree may be cleared. Koalas typically relocate overnight to nearby vegetation, avoiding death or injury.

Machinery operators will keep vigilant watch for any injured vertebrates (including snakes and lizards) resulting from clearing activities. Injured wildlife must receive veterinarian treatment.

Conduct surveys prior to any tree felling to identify hollow-bearing trees.

Opportunities for environmental improvement

Fence and manage regrowth vegetation and highly sensitive habitats within Arrow land to ensure its long-term viability.

Improve existing corridors (including riparian zones) through buffer planting. Two areas are worthy of particular note:

On Completion of Vegetation Removal

Initiate rehabilitation procedures in accordance with the requirements of the **Environmental Management SOP - Rehabilitation.**

Monitoring Requirements

Initiate a 'no net loss' policy in regard to species numbers or sustainability of significant flora species.

Routine (annual) inspections of undisturbed land to identify any evidence of vegetation disturbance.

Inspections of scheduled vegetation removal events to ensure compliance with vegetation and habitat environmental management requirements.

Monitor offset planted areas to ensure success of plantings.

Performance Criteria:

No net loss if important vegetation communities and wildlife habitat.

Enhancement of environmental conditions as they relate to vegetation and habitat (e.g. improvement of exiting wildlife corridors etc).

Attachments

Schedule 1 – details of site specific environmental management requirements, procedures or plans.

Purpose

Arrow Energy activities associated with the establishment of exploration and production wells, well sites, facility sites, and gathering infrastructure involve the disturbance of the ground. The purpose of this document is to manage the ground disturbance activities and to minimise associated impacts on the environmental values of artefacts of archaeological significance, soils, vegetation, watercourses and water quality.

Environmental Protection Objectives:

The objectives of the ground disturbance and erosion management SOP are:

- To avoid disturbance of rare or threatened flora, vegetation communities and fauna habitat wherever possible and where unavoidable to minimise the disturbance to the smallest practical disturbance footprint.
- To avoid or minimise disturbance of sites of cultural or historic significance.
- To minimise any deterioration of the agricultural value of land being disturbed.
- To minimise disturbance of vegetation including crops, pasture and native vegetation.
- To minimise soil erosion from disturbed areas.

Responsibilities

Title	Responsibilities
Chief Executive Officer	Responsible for ensuring that expectations and systems are in place to manage ground disturbance and erosion and that adequate resources are made available to minimise related concerns through site selection, site design, equipment selection and during operations.
Engineering Manager	Responsible for ensuring that ground disturbance and erosion related issues are considered and adequately addressed through site selection, site design and equipment selection.
Field / Facility Managers	Responsible for ensuring that site based personnel are aware of their specific responsibilities with respect to ground disturbance and erosion management and that site personnel have the time and resources to adequately manage and respond to related Issues. Field / Facility Managers are also responsible for ensuring application of this SOP at site level.
Field / Facility Personnel	Responsible for implementing the requirements of this SOP within their area of activity.

Management Requirements

Standard procedures are set out below. Any site specific or more detailed environmental management requirements, procedures or plans are detailed in Schedule 1, attached.

Planning and Preparation

Ground disturbance works are to be planned.

Cut and fill earthworks, and disturbance of rootstock and topsoil is to be minimised.

Understand the soil profile (type, depth, thickness) prior to commencement of land disturbance works.

Limit land disturbance to the minimum necessary for conducting the petroleum activity.

Clearly identify and mark the designated work site i.e. the area of proposed land disturbance including the area of vegetation to be cleared and the area required for stripping of topsoil, excavation and stockpiling of topsoil, spoil and clearing residue. The area of land required for the designated work site will be determined by the requirements of the work to be completed.

Arrange for temporary fencing (e.g. star pickets and barricade tape / fencing) of areas containing rare or threatened plants, significant vegetation communities and fauna habitat.

Remove vegetation in accordance with the **Environmental Management SOP - Vegetation and Habitat.**

Obtain all permits, authorities and consents required to carry out the proposed works.

Ground Disturbance Works

Do not clear vegetation outside of the designated work site.

In the event of the discovery of a potential archaeological artefact (indigenous or non-indigenous) or skeletal remains, cease excavation and follow the **Environmental Management SOP - Cultural Heritage.**

Vegetation cleared within the designated work site shall be placed to one side of designated work site for re-use in rehabilitating the site.

Remove the top layer of the soil profile and stockpile in a manner that will preserve biological and chemical properties. The stockpile should be no more than 2 metres high and maximum thickness in any direction of 3 metres. If the topsoil is to be stockpiled for more than 6 months, it should be seeded with local grasses and fertilised as soon as possible, and turned annually. Reuse the soil for rehabilitation purposes in accordance with the **Environmental Management SOP - Rehabilitation.**

Do not clear any riparian vegetation (vegetation along the land / water interface) or allow vehicles, plant and equipment to enter or traverse riparian vegetation. Riparian vegetation is to be clearly identified and marked prior to commencement of ground disturbing works in the vicinity of watercourses or water bodies.

Do not push clearing residue into a watercourse or water body or drainage line and remove any residue that might block or constrict flows in a watercourse or drainage line.

Topsoil shall be stripped and stockpiled in areas where soil will be highly disturbed or compacted, or where excavation will take place. The nominal stripping depth is to be 150mm unless site conditions indicate otherwise.

Stockpile topsoil separately from vegetation clearing residue (if any), subsoil, or any other excavated materials and minimise the opportunity for mixing, e.g., through separation or a geotextile shield (but do not cover topsoil).

Soil shall not be placed:

- in or within 200 metres from any referrable wetland.
- in or within 50 metres of the high bank of any other watercourse;
- in a way that isolates clumps or dissects corridors of vegetation resulting in a reduction in the current level of ecosystem functioning, an increase in threatening processes, or the dissection of corridors of vegetation that provide connection between contiguous tracts of vegetation;
- in a way that damages adjacent live vegetation;
- on slopes greater than 10%;
- on dispersible soils; and
- in existing or potential discharge areas.

Locate stockpiles:

- Within the designated work area.
- On the easement or an area agreed with landowner.
- Outside drainage lines.
- Out of the way of traffic, operational, or maintenance activities.
- So that they are recoverable after completion of land disturbance activity.

Install breaks in topsoil and subsoil stockpile windrows at least every 50m or at strategic locations to allow runoff, vehicles, stock or wildlife to pass through.

Install erosion controls to protect topsoil and subsoil stockpiles from erosion.

Install diversion drains, berms, and/or sediment barriers (e.g., geotextile silt fences) up-slope of disturbed areas to direct clean stormwater run-off away from the site. Stormwater runoff is to be managed in accordance with the **Environmental Management SOP - Stormwater.**

The table below provides guidelines on installing erosion control berms.

Slope	**Soil Erosion Potential**	
	Low – Moderate (Consolidated clays, silty clays, clay loams)	**High – Very High** (Unconsolidated sands, gravels, sandy silts/loams)
0° - 3°	Berms not required	40 m
3° - 15°	100 m	30 m
15° - 20°	70 m	20 m
20° - 25°	30 m	15 m
> 25°	20 m	10 m

Note: Flat areas < 5° slope in areas of sandy soils may not require many berms due to the high infiltration rates expected.

If there is a cessation of activities due to weather conditions, stabilise soils and install and maintain appropriate erosion controls.

Secure any excavations to protect native fauna and stock from entrapment in accordance with the **Environmental Management SOP - Wildlife and Stock**.

Discharge any trench or excavation water to land through energy dissipating structures and sediment traps (e.g. straw bale and geotextile basin) and minimise runoff to waterways and drainage lines.

On Completion of Works

Backfill trenches or excavations to match original soil profile by:

- Replacing and compacting subsoil to as near as possible (75 to 85%) to the in-situ density of surrounding soils to minimise the risk of subsidence.
- Removing and disposing of excess spoil in accordance with landowner requirements.
- Spreading and shaping topsoil to match the surrounding contours.

Install and maintain erosion control structures (e.g., silt fences, straw-bale barriers).

Initiate rehabilitation procedures in accordance with the requirements of the **Rehabilitation Environmental Management SOP.**

Monitoring Requirements

Inspect erosion and sediment control structures regularly (monthly) and immediately after heavy rains during maintenance activities and prior to rehabilitation starting.

Maintain erosion and sediment control structures by ensuring silt fences are upright, securely fixed to star pickets and that any sediment or residue accumulating behind the fence or barrier is removed and disposed of appropriately to maintain the structures retention capacity.

Performance Criteria

Soil quality and land stability is maintained such that plant regrowth is not inhibited and the existing land uses are maintained or restored.

Attachments

Schedule 1 – details of site specific environmental management requirements, procedures or plans.

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ENVIRONMENTAL MANAGEMENT SOP WEED AND PATHOGEN

SOP: 99-V-SOP-0017
REV: A
STATUS: Draft
Review Date: <date>
DOC OWNER: Environment Manager

Purpose

Earthworks, vehicle and personnel movements associated with Arrow Energy's activities have the potential to cause the spread of existing weed and plant and animal pathogen infestations, and to introduce weeds and pathogens to properties within the development area.

Environmental Protection Objectives:

The objectives of the weed and pathogen environmental management SOP are:

- To prevent project activities from introducing or spreading environmental and noxious weeds and plant and animal pathogens.

Responsibilities

Title	Responsibilities
Chief Executive Officer	Responsible for ensuring that systems and resources are in place to adequately manage weeds and pathogens in the project area
Field / Facility Managers	Responsible for ensuring that adequate facilities and resources are allowed / provided for the correct precautionary measures and wash down procedures to be conducted, and that environmental management requirements are implemented locally.
Field / Facility Personnel	Responsible for allocating specific responsibilities associated with management of weeds and pathogens to specific named individuals. Allocated responsibilities must include but need not be limited to: ▪ Maintenance of washdown facilities. ▪ Inspection of vehicles to ensure adequate washdown has been completed. ▪ Periodic inspection of work areas to ensure that infestations of weeds are not encroaching into areas previously unaffected by pest species.
All personnel involved in the transport, storage and use of hazardous materials are responsible for ensuring that activities are conducted in accordance with these requirements.	

Management Requirements

Standard procedures are set out below. Any site specific or more detailed environmental management requirements, procedures or plans are detailed in Schedule 1, attached.

Planning and Preparation

Train and induct personnel in the requirements of this SOP before commencing project activities.

Ensure personnel are aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one vegetation type to another.

Washdown Procedures, Chemicals, Equipment and Facilities

The matrix below (sourced from the *Petroleum Industry – Minimum Pest Spread Advisory Guidelines*) determines the type of wash required

		Potential contact with weeds		
		Dense infestations. Contact with weeds unavoidable	Large numbers of scattered plants or clumps of weeds that can be driven or walked around. Contact probable	Small patches of weeds or individual plants. Easily avoided. Contact with weeds feasible.
Operators actions	Risk	High	Medium	Low
Drove off road through vegetation. Walked extensively through vegetation. Worked in muddy and wet conditions. Worked amongst plants where seeds are visibly present.	H	Full Clean	Full Clean	Wash down
Drove on unsealed roads. Pulled onto the road shoulder. Had some contact with vegetation either on foot or with the vehicle	M	Full Clean	Wash down	Wash down
Travelled on sealed roads only. Did not walk off designated paths.	L	Visual Inspection and shake down	Visual Inspection and shake down	Visual Inspection and shake down

Full Clean

⇒ Vehicle is cleaned from bumper to bumper using appropriate methods which may include hosing down, vacuuming or compressed air blowers. Vehicle components that can harbour vegetative material are removed and cleaned. Particular attention is paid to carpets, floor mats and seats within the vehicles cab. The cleaning would be done in a designated clean down facility. All effort is must to remove all contaminates from the vehicle before it leaves an infested area.

⇒ The operator is obliged to take all necessary steps to ensure that no contaminates are attached to clothing including boots, laces, sock, trouser turnups, seems, shirt cuffs or pockets. Contaminated clothing to be removed, shaken out, cleaned and thoroughly inspected prior to leaving the site.

⇒ Particular attention should be paid to storage areas on the vehicle including tool boxes. If necessary the vehicle should be inspected by a third party to ensure that the risk of weed spread is reduced to an absolute minimum.

Wash Down

⇒ All exposed areas of the vehicle are cleaned using compressed air, vacuum, brush or a high pressure spray. Particular attention is paid to the carpets, floor mats and seats within the cab, wheel wells, running boards and radiator. Wash down should be conducted at a designated wash down facility.

⇒ Operator must ensure that prior to leaving a contaminated area all clothing (boots, socks, pants, pockets, laces and shirts), toolboxes and storage compartments are free of contaminates.

⇒ All reasonable effort must be made to ensure that both the operator and the vehicle, toolboxes and equipment are free of contaminates prior to leaving an area.

Visual Inspection and Shake Down

⇒ A visual inspection of the vehicle is made, including the radiator, wheel wells, running boards and particularly the carpets, floor mats and seats within the cab. Any suspicious seeds are brushed off prior to leaving a site. If seeds or vegetative materials are found or cannot easily be removed and disposed of, the vehicle is taken to a designated clean down facility within the core infestation area and procedures under the "wash down" recommendation are followed.

⇒ The operator must ensure that all personnel effects including toolboxes, equipment and clothing are free of contaminates prior to moving off site.

Where a work site has been established, use the temporary washdown facilities located at the access point to the site may be required. Portable washdown facilities will be located near designated work areas for the duration of works. The number and type of portable units will depend on the location of the work activity and vehicle movements to and from the site to ensure adequate cleaning of vehicles as they entre/exit the work area.

A permanent washdown facility will be located at the Arrow's main depots to ensure that vehicles are cleaned thoroughly prior to leaving the area, or entering the area. Also government-provided washdown facilities may also be located in the area.

A disinfectant such as Aseptol or Stericide (or a similar product) will be used where washdown for animal pathogens is required.

Phytoclean or a similar product will be used as the disinfectant for washdown where weeds has been identified.

Record the details of the washdown a 'Weed Hygiene Declaration' form, with is designed to meet the legislative requirements of a 'written notice' under the Land Protection (Pest and Stock Route Management) Act 2002. This form must to be retained with the vehicle, item of plant, or equipment for the period until the next washdown, and then it should be filed by the operating company for a period of 5 years. The most recent washdown form must also be available upon request by landowner or government officer. A copy the Weed Hygiene Declaration form must be kept by the company owning/using the vehicle, plant, equipment and/or Arrow Energy for a period of 5 years.

Before Commencing Work

Plan maintenance activities so that movement of plant and equipment between properties or areas with weed infestations is minimised.

All vehicles, plant and equipment must be thoroughly washed down with high-pressure water before travelling to the designated work site and commencing any activities.

Establishing a Designated Work Site

Prior to establishing a designated work site and commencing scheduled activities, engage a suitably qualified specialist to assess the presence of, and appropriately treat, any infestations of environmental and/or noxious weeds.

The assessment is to be undertaken at least one month prior to the commencement of scheduled maintenance activities.

If weeds are not actively growing at the time of inspection, the location and extent of the infestation is to be recorded, the area of the infestation fenced or marked to exclude traffic (if practicable and by agreement with the landowner) and treatment of the infestation undertaken later when the weeds are actively growing.

Treat weeds only with target-specific, non-persistent (i.e., bio-degradable) herbicides except on properties where organic or biodynamic farming is practiced, where the method of treatment will be agreed with the landowner.

Do not remove weeds by hand.

Segregate weeds removed from designated work sites from all other materials and allow to decompose.

Erect temporary fencing (e.g., electric fence) around designated work sites to exclude stock from any stripped area or excavation or stockpile.

Site temporary washdown facilities to ensure that run-off is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas. Where there is a high risk of run-off to adjacent areas, construct a washdown pad comprising a sump lined with an impervious membrane and filled with coarse crushed rock. Pump out sump, as required, and dispose of run-off water to the infected area or property, in accordance with landowner requirements.

Sourcing Maintenance Materials

Materials such as bedding sand, topsoil, straw bales and sand bags must only be brought to site once ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A Weed Hygiene Declaration form must be requested from the supplier where there is possible risk of contamination in products. This form must be kept on record by Arrow Energy for a period of 5 years.

Weed Control

Engage a suitably qualified specialist to undertake, or to train Arrow personnel to undertake, an annual inspection of areas disturbed by Arrow activities (e.g. well sites, access roads, pipeline ROWs) for environmental and noxious weed infestations resulting from Arrow activities. The inspection must be undertaken at least one month before the end of the period in which weeds are actively growing to allow adequate time for effective treatment.

Record the location and extent of environmental and noxious weed infestations and engage a suitably qualified weed control contractor to treat the infestations if they can reasonably be attributed to Arrow associated activity.

Following completion of activities and rehabilitation, monitor designated work sites where environmental or noxious weeds were identified or where works involved ground disturbance for outbreaks of environmental and noxious weeds and engage a suitably qualified weed control contractor to treat the infestations.

Keep to designated access tracks and avoid driving over boggy or disturbed soils.

Precautionary Procedures

Regularly inspect temporary fencing for breaches and correct operation, in particular prior to leaving the designated work site at the end of each workday where the maintenance activities extend for more than one day.

Monitoring Requirements

Conduct regular weed monitoring monthly during and after construction to determine any spread of infestation. Employ weed management techniques as required to control any uncontrolled spread.

Inspect Washdown Registers quarterly to ensure compliance with these requirements.

Performance Criteria

Arrow activities do not result in new weed infestations or the spread of pathogens.

Areas treated for weed infestations return to native/former vegetation status.

Attachments

Schedule 1 – details of site specific environmental management requirements, procedures or plans.

Purpose

Safe movement of wildlife and stock in the vicinity of Arrow Energy's work areas and infrastructure needs to be maintained for the lifecycle of the project. There is a potential for wildlife and stock to entre work areas and to become trapped in excavations and trenches etc. The purpose of this document is to detail management controls to ensure that wildlife and stock are not harmed or killed as a result of project activities, and that their movement through the area is not compromised.

Environmental Protection Objectives:

The objectives of the wildlife and stock environmental management SOP are:

- To minimise injury or death to wildlife and stock as a results of project activities.
- To minimise impacts on wildlife and stock movements through the project area.
- To ensure that any injured wildlife and/or stock are cared for by a veterinarian or suitably qualified animal carer.
- That all injuries and deaths of wildlife and stock are reported and recorded during the life of the project.

Responsibilities

Title	Responsibilities
Chief Executive Officer	Responsible for ensuring that systems are in place to manage wildlife and stock and that adequate resources are made available to minimise related concerns through site selection, site design, equipment selection and during operations.
Engineering Manager	Responsible for ensuring that wildlife and stock management is considered and adequately addressed through site selection, site design and equipment selection.
Field / Facility Managers	Responsible for ensuring that site based personnel are aware of their specific responsibilities with respect to wildlife and stock management and that site personnel have the time and resources to adequately manage and respond to related issues. Field / Facility Managers are also responsible for ensuring application of this SOP at site level.
Field / Facility Personnel	Responsible for implementing the requirements of this SOP within their area of activity.

Management Requirements

Standard procedures are set out below. Any site specific or more detailed environmental management requirements, procedures or plans are detailed in Schedule 1, attached.

Planning and Preparation

A contact list of licensed veterinarians and suitable wildlife carers who can be contacted in the event that stock or wildlife are injured, or require re-location must be prepared and be made available during all site works, and operations.

Access of stock to active work areas will be restricted, where possible.

Neighbouring landowners will be consulted to determine the requirements for stock movements in the vicinity of the work area.

Gates, holding yards and other areas used to move or contain stock will ne identified and discussed with landholders prior to site works to determine any specific requirements (e.g. gates that re to remain locked etc).

Any restrictions placed on stock movements in the vicinity of work areas will be agreed with landholders so that disruption of stock is minimised.

Specific landholder requirements as they relate to stock movements to be communicated with all field / facility personnel.

Trenching works must be planned so that the amount of time that an excavation is left open is kept to a minimum. Laying and burying of pipes should occur as soon as possible after the trench has been created.

Fauna handlers will be present during any intrusive works to trap and re-locate wildlife as required.

Work Area Design

Temporary barriers or fences will be erected around open excavations (including trenches) using heavy-duty plastic mesh fencing or electric fencing to exclude stock and larger wildlife from the area.

Small excavations will be covered with water-resistant structural plywood sheets or steel plates secured in place by steel pegs to prevent dislodging by stock or fauna.

Construct exit points along the trench at regular intervals (every 200m or at one end of each trench if shorter in length). Exit points may be created by digging a sloped ramp approximately 0.5-1m wide or bullding makeshift ladders with branches from the bottom of the trench to the surface. Trapped animals (e.g. wallabies, bettongs) may use these to exit the trench.

Trenches must be checked for the presence of trapped fauna (e.g. trapped frogs, lizards, snakes, mammals (e.g.)) a daily basis prior to laying pipes and closing trenches (i.e. shortly after sunrise).

Captured animals must be relocated by a qualified animal carer or veterinarian to nearby vegetation. This process will be facilitated by:

- Locating two sawdust/wood filing filled hessian bags at the base of the trench approximately every 200m when passing through native vegetation. These bags aim to contain any animals within portions of the trench.
- Locating the above bags approximately every 400m when passing through disturbed land.

- Bags may be moved prior to trench closing. Additional bags may be positioned wherever high fauna activity is likely.
- Clearing of trenches should be undertaken by a suitably qualified animal handler or ecologist.
- Details of trapped and released animals will be recorded (e.g. date, GPS location, species, condition) for inclusion into the DERM WildNet database. This will provide valuable information on the types of animals within the region and may provide additional information for any EVR species.

Upon decommissioning, sites will be rehabilitated such that unhindered stock movement is allowed through the former work area. If infrastructure is to be retained in place, stock will be excluded with permanent fencing.

Contact with Wildlife and/or Stock

Stock and/or wildlife are not to be handled by site personnel.

Stock is to be relocated by the registered owner, or a suitable animal carer.

Wildlife is to be left undisturbed. If the wildlife does not vacate the work area of its own accord, a qualified animal handler/carer is to be contacted to allow safe re-location of the animal.

Any injured stock or wildlife will be handled by and referred to a veterinarian or qualified animal carer.

Road kills will be monitored, and reduced traffic speeds together with increased signage will be implemented where required.

Monitoring Requirements

All wildlife and stock injuries or deaths attributable to project activities will be recorded, reported and investigated. Resultant corrective actions will be implemented.

The condition of gates, fences etc will be inspected on a regular basis (at least every 12 months) to ensure that appropriate stock movements are maintained.

Performance Criteria

No stock or wildlife to be injured or killed during the life of the project.

Any complaints from landholders are to be recorded, addressed, and any corrective actions implemented.

Attachments

Schedule 1 – details of site specific environmental management requirements, procedures or plans.

arrow energy go further

ENVIRONMENTAL MANAGEMENT SOP REHABILITATION

SOP: 99-V-SOP-0021
REV: A
STATUS: Draft
Review Date: <date>
DOC OWNER: Environment Manager

Purpose

Following ground disturbance (resulting from drilling, construction, operation, maintenance or decommissioning activities), rehabilitation of the land will be required. This document sets out the procedures for the rehabilitation of disturbed areas.

Environmental Protection Objectives

The objectives of rehabilitation are:

- To successfully rehabilitate areas of ground disturbed by project activities so that they are stable and support the continuation of pre-disturbance land uses, or a use agreed with the land owner.
- To minimise disturbance to vegetation including crops and pasture, stock, native flora and fauna and farm and forestry infrastructure.
- To minimise land degradation caused by erosion and sedimentation as a result of project activities.

Responsibilities

Title	Responsibilities
Chief Executive Officer	Responsible for ensuring that expectations and systems are in place to manage rehabilitation activities and that adequate resources are made available to minimise related concerns through site selection, site design, equipment selection and during operations.
Engineering Manager	Responsible for ensuring that rehabilitation related issues are considered and adequately addressed through site selection, site design and equipment selection.
Field / Facility Managers	Responsible for ensuring that site based personnel are aware of their specific responsibilities with respect to rehabilitation and that site personnel have the time and resources to adequately manage and respond to related issues. Field / Facility Managers are also responsible for ensuring application of this SOP at site level.
Field / Facility Personnel	Responsible for implementing the requirements of this SOP within their area of activity.

Management Requirements

Standard procedures are set out below. Any site specific or more detailed environmental management requirements, procedures or plans are detailed in Schedule 1, attached.

Planning and Preparation

Train and induct all supervisory, maintenance and contractor personnel in rehabilitation procedures.

Engage suitably qualified and experienced contractors to undertake rehabilitation of disturbed ground.

Prior to undertaking ground-disturbing maintenance activities, seek agreement with landowners on rehabilitation standards and the timing of rehabilitation activities.

Maintain a photographic record of rehabilitation including a pre-existing condition assessment. Have particular regard to sites of conservation significance and sites susceptible to erosion.

General Requirements

Commence preliminary rehabilitation activities promptly and progressively as ground disturbance works are completed, to stabilise soils and minimise periods of exposed disturbed ground.

Treat weed infestations in soil and clearing residue stockpiles in accordance with the requirements of the **Environmental Management SOP - Weed and Pathogen** before using these materials in rehabilitating disturbed ground.

Ensure that the replacement of disturbed soils is in accordance with the requirements of the **Environmental Management SOP - Ground Disturbance and Erosion.**

Manage residue from vegetation clearing in accordance with the requirements of the **Environmental Management SOP - Vegetation and Habitat.**

Seeding and re-vegetation programs will consider:

- Natural re-seeding of native species wherever possible through stockpiling of any removed topsoil. Native vegetative waste should be spread over disturbed areas to provide a natural source of seed and additional fauna refuge.
- Use of native grass (or native alternative) species when rapid vegetative cover is required to prevent soil loss. Stock of local provenance should be utilised where available.
- Species utilised for rehabilitation should be specific to the original ecosystem wherever possible. For example, the use of readily available sources of *Lomandra longifolia*, *Carex* spp., *Chrysopogon filipes* and *Arundinella nepalensis* would enhance rehabilitation efforts in riparian ecosystems.
- Well gathering lines should be seeded with grasses and small shrub species (e.g. *Acacia montana*) to provide soil stability and cover. While the use of exotic grass species (e.g. *Rhodes grass*) is acceptable in existing clearing areas, the use of exotic grasses in remnant or regrowth vegetation should be avoided. The use of exotic grasses in native vegetation will exacerbate and accelerate edge effects.

Pasture

Source the exotic seed mix required by the landowner.

Spray existing vegetation, if present, with herbicide 4 to 6 weeks prior to site preparation, unless the landowner does not permit use of chemicals.

Prepare the site for seeding and fertilising:

- Disk the surface.
- Cultivate the surface with an agro-plough or equivalent.
- Disc again for heavy soils or use a cultivator for light soils.
- Harrow.

Seed and fertilise the prepared area:

- Apply seed mix at the recommended rate.
- Apply a general broadcast fertiliser as per the recommended rate, unless otherwise specified by the landowner.

Harrow again so that topsoil is loose and friable.

Erect temporary fencing around rehabilitated areas to exclude livestock, if necessary, or arrange with landowners to exclude livestock until pasture is re-established and able to withstand grazing.

Native Vegetation

Rip compacted soils along contours to a maximum depth of 300 mm before subsoil and topsoil are returned to and redistributed over the site. Replace and reshape soils to conform to the original surface and re-form drainage lines.

Cover topsoil where there is a high risk of erosion (e.g. jute mat or an equivalent pinned at 4 pins/m^2; thick mulch layer; hydroseeding with bonding fiber matrix).

Respread stockpiled clearing residue across the disturbed areas unless the landowner directs otherwise.

If topsoils are not returned to disturbed areas because they have been buried or lost or were not present in native vegetation, fertilise disturbed area with a low phosphate fertiliser as per the recommended rate, unless otherwise directed by the landowner.

Where regeneration does not stabilise the site and provide adequate cover, augment with seed or seedlings of local provenance sourced from registered seed banks. Order seed or seedlings at least six months in advance of stock being required for rehabilitation.

Install physical barriers to restrict access to the area undergoing rehabilitation. On private land, this may involve the erection of temporary fences to landowner specifications and on public land, the construction of berms and/or distribution of logs to restrict access to the site.

Monitoring Requirements

Monitor rehabilitation at the following intervals until rehabilitation is successful and the landowner has accepted responsibility for the ongoing management of the land.

- Quarterly, for all sites.
- After significant rainfall events and monthly during winter for sites with a high erosion potential.

Undertake remedial works to control weeds, stabilise eroding soils and replant or revegetate areas where recovery of pasture or native vegetation species is inadequate.

Performance Criteria:

Successful rehabilitation will be indicated by:

- No significant soil erosion resulting in rills, gullies or downstream sedimentation.
- Stabilised soils and native species regeneration in areas of native vegetation; or Pasture grasses coverage equivalent to adjacent land after one year and successful grazing of land by stock.
- No environmental or noxious weed infestations.

Attachments

Schedule 1 – details of site specific environmental management requirements, procedures or plans.

Draft recommendations

The Draft Integrated Assessment Report recommendation of the Tasmanian Planning Commission to the Tasmanian Government Minister administering the *State Policies and Project Act 1993* is that the Lauderdale Quay Project of State Significance not proceed, for the reasons set out below.

1. The Commission delegated Panel (the Panel) finds that the only substantial factor in favour of recommendation that the project proceed is that the 'reclamation' stage of the project would most likely bring economic benefits for the State and that the net present monetary value of those benefits may be in the order of $35.6 million (Section 2.5 of this Report - Economic impacts and analysis).

2. **The Panel finds that the above factor is overwhelmingly outweighed by the following considerations.**

   2.1 Sustainability of the development (Section 2.7.4 of this draft Report)

   The degree to which the Lauderdale Quay project represents sustainable development is a fundamental consideration in the decision-making process. Notwithstanding the particular characteristics of the proposed canal estate, the Panel's view is that the construction of a residential estate on the tidal flats of Ralphs Bay is an inherently unsustainable approach to satisfying demand for residential land.

   It is the view of the Panel that the Lauderdale Quay proposal cannot be characterised as *'sustainable development'*. In that respect the proposal does not satisfy the first two objectives of the State's Resource Management and Planning System. Nor does the proposal align with the second principle of the Tasmanian State Coastal Policy 1996: *'(t)he coast shall be used and developed in a sustainable manner'*.

   2.2 Strategic planning generally (Section 2.7.1 of this draft Report)

   The Panel finds that the Lauderdale Quay proposal is not wholly consistent with the objectives of the Resource Management and Planning System.

   2.3 Urban form (Section 2.7.5 of this draft Report)

   The Panel finds that, although well designed and engineered, the proposed development would be a major and unacceptable intervention into Ralphs Bay. It would be an intervention which would only be acceptable if warranted by overwhelming and clearly demonstrated benefits arising from the proposed project: the Panels' finding is that the project would not produce such benefits.

   The Panel's opinion is that the proposal cannot be easily amended (if at all) to produce an urban design compatible with the Ralphs Bay location.

2.4 Avian ecology (Section 2.2.2 of this draft Report)

The Panel considers that the importance of Lauderdale to the Red-necked Stint and to the Pied Oystercatcher is such that it cannot recommend approval of the proposal.

3. Additional matters militating against approval of the project are:

3.1 Visual impact (Section 2.7.6 of this draft Report)

The visual impact of the development (in particular in its reclamation stage and to a lesser extent thereafter) would be significantly detrimental and, while not sufficient on its own to justify rejection of the proposal, it is a negative factor in the overall assessment.

3.2 Construction duration (Section 2.1.1 of this draft Report)

The total estimated time required to complete the proposed islands is about 40 months. The Panel finding is that some of the construction impacts could have unacceptable impacts as a result of the extended construction duration. These impacts mainly centre on noise, dust and odour as set out in Section 2.1.5 of this draft Report. In the event that construction is delayed, those impacts could become more significant.

3.3 Social, cultural, health and general community impacts (Section 2.6 of this draft Report)

The Panel considers that the impact of the development of the project on the amenity of the existing community, particularly during the construction period, as well as the likely lack of integration and social cohesion of the completed development with the Lauderdale community, are significant negative matters to be taken into account.

3.4 Need for the development (Section 2.7.2 of this draft Report)

Although there is a demand underpinning the proposal, the Panel concludes that further and more exhaustive market demand studies would be required to demonstrate that the risks and implications of the project failing through a lack of sales are acceptable. The strength and depth of demand for the proposal has not been demonstrated by the Proponent to a point where the Panel could confidently recommend approval in the light of these risks.

3.5 Environmental offsets (Section 2.2.3 of this Report)

While the environmental offset measures proposed as part of the project have the potential to partially offset the ecological losses caused by the proposed development, the Panel is not satisfied that these measures will be effective to any substantial degree. Although the proposed environmental monitoring programs would reveal whether the measures are succeeding, there is no apparent solution in the event they are not succeeding.

3.6 Performance conditions and bonds (Section 2.11 of this Report)

The Panel considers that the issues referred to in the above paragraphs are matters for which neither the conditions suggested on behalf of the Proponent in its draft set of conditions (Exhibit W1, Schedule G) nor any other conditions of which the Panel can conceive, would resolve the reasons for the recommendation that the project should not proceed.

3.7 Other risks and uncertainties

The following matters, while not considered of themselves to be reasons for refusal, collectively support the adoption of a cautious response:

- **Dredging and sedimentation (Section 2.1.2 of this draft Report)**

The Panel is of the view that an element of uncertainty exists in what has been referred to as the 'Ralphs Bay Conundrum'. If the proposal were to proceed, the Panel would recommend further detailed sampling and testing of the sediments to be dredged within the site, and resolution of the variations between metal levels found in sediments and levels resulting from elutriate tests (the so-called 'Ralphs Bay Conundrum').

- **Flushing, sedimentation and dredging (Section 2.1.9 of this draft Report)**

Sediment transport/build-up in the internal canals and the main navigation channel of the proposal remains a concern which cannot be modelled with certainty. The implications of more frequent maintenance dredging remain in issue.

- **Pied Oystercatchers (Section 2.2.2 of this draft Report)**

The Panel considers there is a significant risk that a large part of the Lauderdale population of the species would be lost as a result of the proposed development.

- **Spotted Handfish (Section 2.2.2 of this draft Report)**

The Panel concludes that the project has the potential to exacerbate the threat to the Spotted Handfish from the Northern Pacific seastar in the event that the development enables the proliferation of the latter species. The Panel also concludes that there is a potential for members or colonies of the Spotted Handfish to be located much closer to the proposed development site than presently determined, and to therefore be susceptible to sedimentation and other forms of pollution.

Recommendation to the Australian Government pursuant to the Agreement between the Commonwealth of Australia and the State of Tasmania under Section 45 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, Commonwealth).

The Commission delegated Panel upon the information currently available, recommends against approval of the controlled action constituted by the Lauderdale Quay development, by reason of the potential impact upon the Red-necked stint, a migratory avian species listed pursuant to the EPBC Act.

Australian Government
Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

29 October 2009 14:05

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Area

Buffer: 5 km

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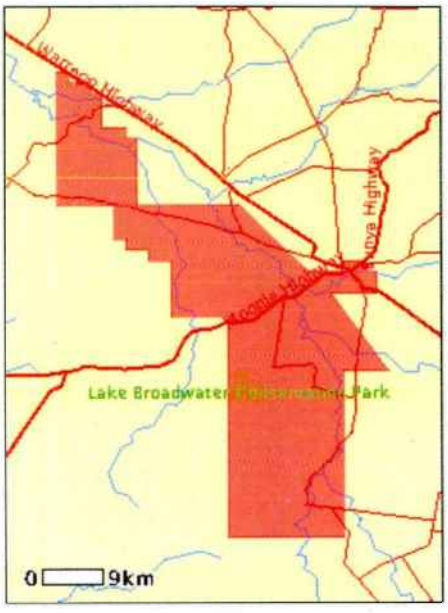

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Report Contents: Summary
Details
- Matters of NES
- Other matters protected by the EPBC Act
- Extra Information

Caveat
Acknowledgments

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	4
Threatened Species:	24
Migratory Species:	19

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Places on the RNE:	2

Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)	
KARRAN LAKE NATURE RESERVE	Within same catchment as Ramsar site

Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	Community known to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot	Endangered	Species or species habitat may occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll	Endangered	Species or species habitat may occur within area
Nyctophilus timoriensis (South-eastern form) Greater Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Ray-finned fishes		
Maccullochella peelii peelii Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area

Reptiles

Anomalopus mackayi Five-clawed Worm-skink, Long-legged Worm-skink	Vulnerable	Species or species habitat may occur within area
Furina dunmalli Dunmall's Snake	Vulnerable	Species or species habitat may occur within area
Tympanocryptis pinguicolla Grassland Earless Dragon	Endangered	Species or species habitat may occur within area

Plants

Acacia chinchillensis	Vulnerable	Species or species habitat likely to occur within area
Cadellia pentastylis Ooline	Vulnerable	Species or species habitat likely to occur within area
Dichanthium queenslandicum King Blue-grass	Vulnerable	Species or species habitat likely to occur within area
Digitaria porrecta Finger Panic Grass	Endangered	Species or species habitat likely to occur within area
Diuris sheaffiana Tricolour Diuris	Vulnerable	Species or species habitat may occur within area
Homopholis belsonii	Vulnerable	Species or species habitat may occur within area
Philotheca sporadica	Vulnerable	Species or species habitat likely to occur within area
Picris evae Hawkweed	Vulnerable	Species or species habitat likely to occur within area
Rhaponticum australe Austral Cornflower, Native Thistle	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis	Endangered	Species or species habitat may occur within area

Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper	Migratory	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper	Migratory	Species or species habitat known to occur within area

Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit	Migratory	Species or species habitat known to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Tringa glareola Wood Sandpiper	Migratory	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank	Migratory	Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	Migratory	Species or species habitat known to occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper	Listed	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper	Listed - overfly marine area	Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Llsted	Species or species habitat likely to occur within area
Himantopus himantopus Black-winged Stilt	Listed - overfly marine area	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly	Species or species habitat may occur within area

	marine area	
Lathamus discolor Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
Limosa limosa Black-tailed Godwit	Listed - overfly marine area	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
Recurvirostra novaehollandiae Red-necked Avocet	Listed - overfly marine area	Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Tringa glareola Wood Sandpiper	Listed - overfly marine area	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank	Listed - overfly marine area	Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	Listed - overfly marine area	Species or species habitat known to occur within area

Commonwealth Lands [Dataset Information]

Defence

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

Dalby War Memorial and Memorial Park QLD

Indigenous

Kogan Stone Arrangement QLD

Extra Information

State and Territory Reserves [Dataset Information]

Lake Broadwater Conservation Park, QLD

Lake Broadwater Resource Reserve, QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia

- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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vegetation analysis and mapping specialists

Arrow Energy
Dalby Expansion Project

Details of Ecological Values

Prepared by:

3d Environmental in association with Osmotic Ecology

For

Coffey Natural Systems

Final, December 21, 2009

OSMOTIC ECOLOGY
Expertise → Information → Consultation

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Signed on behalf of 3D Environmental

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s. 47F(1) - Director

Name Date: 21/December/2009

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1. INTRODUCTION

1.1 Dalby Expansion Project

Arrow Energy (Arrow) proposes to increase the production capacity of its operations through the Dalby Expansion Project. The project will involve an expansion of operations within existing gas fields at Tipton West, Daandine, Stratheden and Kogan North, and through the initial development of Tipton East, Long Swamp and Meenawarra gas fields. These petroleum tenures are located 20 to 40 km south and west of Dalby, in Queensland's Surat Basin. The Dalby Expansion Project, a continuation of existing operations, will be assessed under the Environment Protection Act 1994 (Qld), as a Level 1 petroleum activity not requiring an EIS.

The Dalby Expansion Project will involve up to 300 new production wells and two integrated production facilities (IPF) including gas compression, water treatment and power generation and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure. Activities are scheduled to occur during 2010 and 2011. At the time of this study, numerous potential IPF location options were considered, including Theten, Stratheden, Duntroon and Lynwood North. Of these, the most likely to be considered for detailed design are Theten and Duntroon (with Lynwood North considered as a secondary option to Duntroon in the event that land access negotitions do not facilitate the development of the Duntroon Facility).

Connection of the proposed Theten and Duntroon facilities would be via either high pressure gas pipelines (approximately 5km in length), connecting the new IPFs to existing sales gas delivery infrastructure or a proposed dedicated 50km long high pressure in-field gas pipeline to provide connection to the proposed Surat to Gladstone Pipeline (SGP). The proposed dedicated connection connection pipeline, which extends approximately 50km from south of Tipton to the southern end of the Surat Gladstone Pipeline (north of Theten) is included in the scope of this study. In the event that the Lynwood North facility is progressed in favour of the Duntroon facility, Lynwood North would be connected into the pipeline. Future facilities to be developed may also be connected to the pipeline.

The pipeline connection route is selected (as for all infrastructure in the Dalby Expansion Project) to avoid areas of moderate or high environmental sensitivity and environmental constraints. Arrow Energy's Environmental Management Standard Operating Procedures will be applied as for infield gathering infrastructure. The final route of the connection pipeline will be dependent on agreements with landholders, and full application of Arrow Energy's Site Selection process including reference to environmental constraints maps.

Gas from the Dalby Expansion Project will supply existing domestic gas contracts and will confirm a viable gas supply for identified export liquefied natural gas (LNG) opportunities. Arrow is planning a larger development, the Surat Gas Project, to meet anticipated large-scale gas production for these opportunities as they progressively come on line from 2012, and expand in response to the energy market.

The Dalby Expansion Project satisfies Arrow's need to meet its contractual obligations under current domestic gas supply agreements, as well as proving that a viable gas supply exists for proposed export LNG developments at and adjacent to Gladstone. Gas produced from the nominated facilities will be initially used to supply residential, commercial and industrial customers and in power generation for sale of electricity to the National Electricity Market. Supply over domestic market requirements will later be directed to proposed LNG developments if they achieve the necessary environmental approvals and financial commitments.

The Surat Gas Project will facilitate further development of Arrow's Surat Basin coal seam gas reserves to meet the demand expected from proposed export LNG developments. Arrow Energy is

preparing a voluntary Environmental Impact Statement (EIS) under the Environment Protection Act 1994 (Qld) for the Surat Gas Project.

This document provides an assessment of the terrestrial ecological values (vertebrates and flora) of areas within the Dalby Expansion Project. The intent of this assessment is to inform the preparation of an Environmental Management (EM) Plan to accompany the Environmental Authority (EA) application as required under the Department of Environment and Resource Management (DERM) Authority for 'Level 1 Petroleum Activities not requiring an Environmental Impact Statement (EIS)'.

The project area lies to the west of Dalby, located within the Eastern Darling Downs Province of the Brigalow Belt South bioregion. Dalby forms a major pastoral and agricultural centre heavily reliant on the fertile alluvial clay plains of the Condamine River and its major tributary, Wilkie Creek for production. Although much of the natural vegetation is heavily fragmented, a number of high value ecological areas occur in the project area vicinity including endangered regional ecosystems, nationally significant ecological communities, threatened flora and fauna under both state and federal legislation, and environmentally sensitive areas including Conservation Parks and Wetlands of National Significance.

The location of the Dalby Expansion Project, including the currently proposed pipeline connection to sales gas infrastructure route, relative to major population centers and relevant petroleum tenures is shown in **Figure 1.**

2. STUDY OBJECTIVES

The study objective is to provide information on the terrestrial biodiversity values including ecosystems, ecosystem sensitivity, and ecosystem values to flora and fauna of varying degrees of significance within the project area. This information will advise the development of an EM Plan for the Dalby Expansion Project.

3. REGULATORY FRAMEWORK

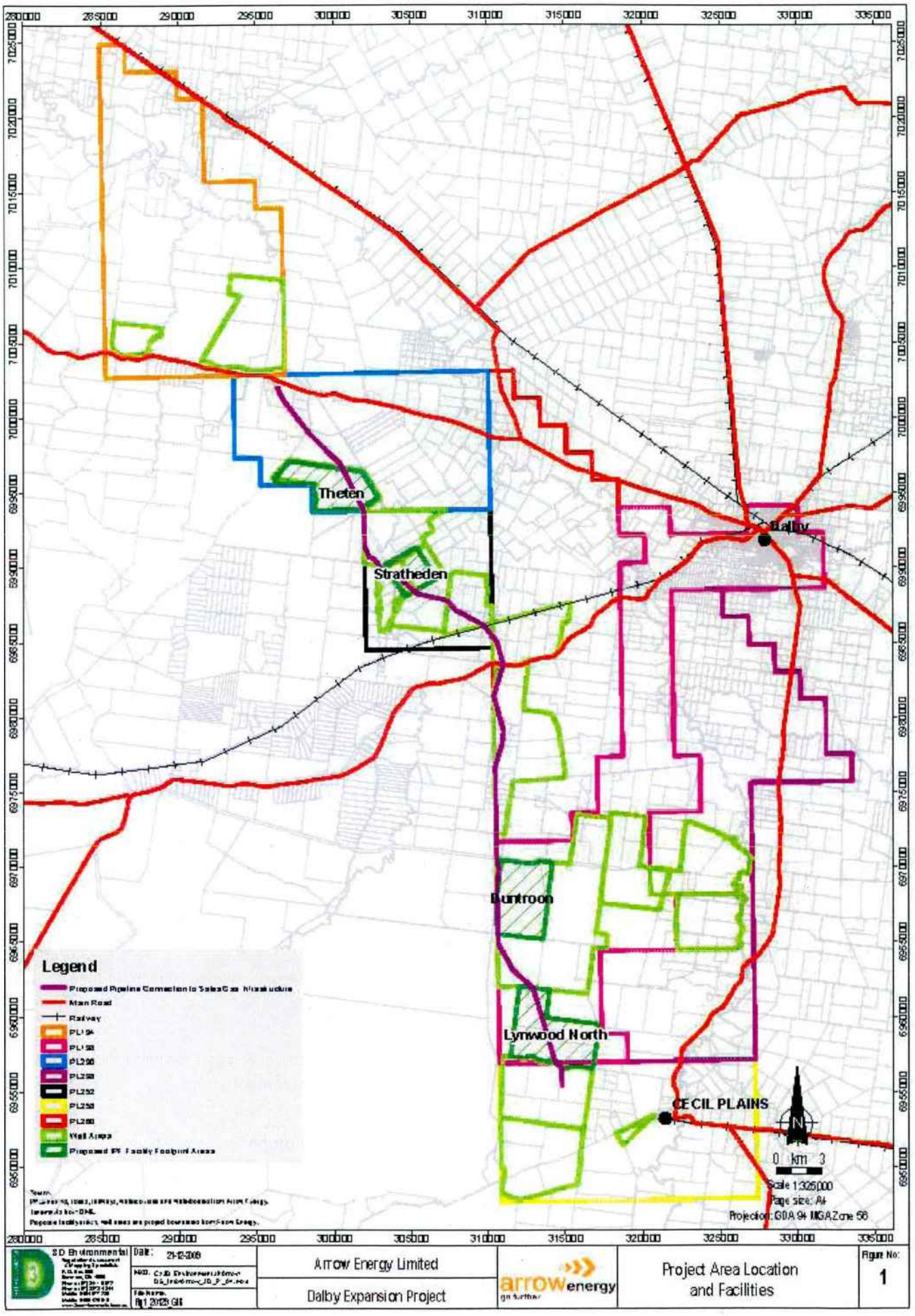
Regulation of petroleum related activities is governed primarily by the Queensland's *Environmental Protection Act 1994* (EP Act). A range of additional statutory mechanisms at both state and federal levels may be triggered during petroleum related activities. These mechanisms are detailed below.

3.1 Queensland Government

Environmental Protection Act 1994

Environmental authorisation for a petroleum related activity is regulated by the Environmental Protection Act 1994 (EP Act). The Act regulates environmentally relevant activities" (ERAs), including those relating to mining and petroleum through the development of environmental impact statements. The *Environmental Protection Regulation 2008* provides a mechanism to enforce the EP Act and allows for an assessment of the risk that an ERA poses to environmentally sensitive areas (ESAs). Details of ERAs for the petroleum industry are listed below:

1) 'Level 1' Petroleum Activities, which are activities considered to have a high risk of causing significant environmental damage; and
2) 'Level 2' Petroleum Activities, being activities considered to have low potential to cause environmental harm.


Theten
Stratheden
Dalby
Duntroon
Lynwood North
CECIL PLAINS
Legend
Proposed Pipeline Connection to SolasGas Infrastructure
Main Road
Railway
PL194
PL195
PL200
PL250
PL252
PL258
PL260
Well Areas
Proposed EP Facility Footprint Areas
0 km 3
Scale 1:325000
Page size: A4
Projection: GDA 94 MGA Zone 56
SD Environmental
Date: 21-12-2009
Arrow Energy Limited
Dalby Expansion Project
arrowenergy
Project Area Location and Facilities
Figure No: 1

The project EA application for the Dalby Expansion project activities outlined in **Section 1.1** is for Level 1 petroleum activities not requiring an EIS. As outlined in the EPA Guideline "Assessment and approval process for environmental authorities for petroleum activities" petroleum activities considered as triggers for the EIS process include those that:

- have a significant impact on Category A or B environmentally sensitive areas;
- involve activities in a marine area;
- involve activities less than 500m from highest astronomical tide;
- involve the construction of a new pipeline under a pipeline licence for a transmission pipeline; and
- involve the construction of a petroleum refining or processing facility (ERA 12 or ERA 13, as defined in Schedule 1 of the *Environmental Protection Regulation 1998*).

The classification of Category A, Category B or Category C ESAs is based on a ranking of environmental sensitivity. Category A ESAs include:

- all areas designated as National Park under the *Nature Conservation Act 1999* (NCA);
- conservation parks;
- forest reserves, and
- the Wet Tropics World Heritage area.

Category B ESAs relevant to natural terrestrial ecology values include the following:

- areas designated under the NCA as Co-ordinated Conservation Areas, Wilderness Areas, World Heritage Management Areas, areas of critical habitat under a conservation plan or areas subject to interim conservation orders;
- conventions to which Australia is signatory including the 'Convention on the Conservation of Migratory Species of Wild Animals' and the 'Convention on Wetlands of International Importance (Ramsar Convention, Iran, 1971);
- Feature Protection Areas (e.g. State Forest Park); and
- Regional Ecosystems scheduled as endangered (Biodiversity Status) by DERM.

Category C ESAs are not listed under the schedules of the Environmental Protection Regulations although are provided within the *Draft Code of Environmental Compliance for Level 2 Petroleum Activities* (DERM, 2008) forming part of the environmental compliance and conditioning framework. Level 2 petroleum activities must not cause impact to Category A or Category B ESAs. Authority for Level 1 petroleum activities may be granted in association with an approved EM Plan with impacts to Category A and Category B ESAs addressed within this plan or assessed within the EIS Framework.

Nature Conservation Act 1992

Actions relevant to the description of ecological values under the NCA include the provision for:

- Eleven classes of protected areas ranging from:
  - national parks (scientific);
  - world heritage management and international agreement areas;
  - national parks (Aboriginal land);
  - nature refuges, and
  - coordinated conservation areas involving private property.

- Seven classes of wildlife — presumed extinct, endangered, vulnerable, rare, common (these classes collectively relate to native species and are protected wildlife), international and prohibited wildlife (these classes relate to non-native species).

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) is the planning initiative underlying regional management of vegetation in Queensland, including clearing of vegetation types, termed Regional Ecosystems (REs). The regional ecosystem classification of Sattler and Williams (1999) is a hierarchical system formed by a three part code with the primary subdivision being bioregion, followed by land zone, and then vegetation. The biogeographic region or bioregion is the primary level of classification for biodiversity values in Queensland describing where the regional ecosystem is found on a state wide basis. Land Zones are geological and geomorphic categories that describe the major geologies and landforms of Queensland. The system is based primarily on geology, with geologic age considered an important determinant (Harris N.D). The classification of Land Zone is generally based on available geological information (Neldner *et al.* 2005) although field inspection is utilised as a supplementary measure where geological mapping is inadequate.

The status of REs is based on their pre-clearing and remnant extent, and is gazetted under the VMA and listed in the RE Description Database maintained by the DERM. The Vegetation Management Status of a regional ecosystem is described in line with the following:

Endangered regional ecosystem: a regional ecosystem that is prescribed under a regulation and has either:

- less than 10% of its pre-clearing extent remaining; or
- 10% to 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 hectares (ha).

Of Concern regional ecosystem: means a regional ecosystem that is prescribed under a regulation and has either:

- 10% to 30% of its pre-clearing extent remaining; or
- more than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 ha.

Not of Concern regional ecosystem: means a regional ecosystem that is prescribed under a regulation and has more than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10 000 ha.

The VMA also has provision for the regulation of essential habitat for species of state significance. Clearing or disturbance to areas of essential habitat will require compensatory habitat measures to be developed.

The *Regrowth Vegetation Code* took effect on October 8, 2009. The code allows for regulation of the clearing of high value regrowth vegetation (HVR) defined as regrowth vegetation that has not been cleared post December 31, 1989. Exemptions to the code apply to clearing of regrowth vegetation for extractive industry within key resource areas or for significant community projects.

Land Protection (Pest and Stock Route Management) Act 2002

The Land Protection (Pest and Stock Route Management) Act 2002 (LPA) provides a framework and powers for improved management of weeds, pest animals and the stock route network. The act provides for designation of threat classes to exotic species which:

- degrade natural resources;
- threaten conservation of biodiversity;
- threaten remnant vegetation;
- reduce rural production; and
- interfere with human health and recreational activities.

Exotic species that pose threat under the listed categories are declared under one of the following three categories detailed below.

- ***Class 1 Pest:*** a pest that has potential to become a very serious pest in Queensland in the future.
- ***Class 2 Pest:*** a pest that has already spread over substantial areas of Queensland, but its impact is considered sufficiently serious to warrant control.
- ***Class 3 Pest:*** a pest that is commonly established in parts of Queensland but its control by landholders is not warranted unless the plant is impacting, or has potential to impact on a nearby ESA.

The mapping of flora species declared under the LPA provides a measure of vegetation condition, particularly when applied to non-statutory assessment measures as described in Eyre *et al.* (2006).

3.2 Commonwealth

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for:

- identification and listing of species and ecological communities as threatened;
- development of conservation advice and recovery plans for listed species and ecological communities;
- development of a register of critical habitat; and
- recognition of key threatening processes.

If a proponent proposes to undertake an action that will have, or is likely to have, a significant impact on a matter of national environmental significance, it may be deemed a 'controlled action' under the EPBC Act. The Minister for the Environment, Heritage and the Arts will decide whether assessment and approval is required under the EPBC Act, and what level of assessment by the Commonwealth is appropriate.

3.3 Non-statutory Mechanisms

DERM's *Biodiversity Assessment and Mapping Methodology* (BAMM) provides for a consistent state wide approach for the assessment of biodiversity values at the landscape scale in Queensland (EPA 2002a). The assessment is based largely on vegetation mapping data generated or approved by the Queensland Herbarium, and the methodology has been used to generate Biodiversity Planning Assessments for each of Queensland's bioregions. These assessments are used by Agency staff, other government departments, local governments or members of the community to advise a range of planning or decision-making processes. Application of the methodology is applied to the identification of areas of significance solely for biodiversity reasons, including threatened ecosystems or taxa, large tracts of habitat in good condition and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes.

Other non-statutory mechanisms include listings for Weeds of National Significance (WONS) which lists 20 species regarded as posing the greatest threat to a range of Australia's natural values and primary industries. Identification of WONS within the project supplements the broader assessment of vegetation community bio-condition.

4. METHODS

4.1 Desktop Literature and Database Review

4.1.1 Flora Methods

Desktop literature reviewed and analysed included raw data derived from database searches, information held by agencies and/or individuals, and interpretive reports. This information is analysed in the following section. Public database searches provided the basis for the majority of background information regarding the presence and distribution of flora species, significant or otherwise, known from or likely to be in the project area. The major databases searched include:

- Commonwealth's EPBC Online Protected Matters Search Tool (DEWHA 2009);
- Queensland Herbarium's HerbRecs and CorVeg databases;
- DERMs Wildnet;
- DERMs Regional Ecosystem Description Database (DERM REDD, Version 6, 2009); and
- DERMs Regional Ecosystem digital data (DERM Version 6.0, 2009).

The Biodiversity Planning Assessment for the Brigalow Belt (EPA Version 1.3, 2008) was analysed to provide additional information relevant to biodiversity significance, essential habitat and regional wildlife corridors. Additional bioregional values were reviewed within expert panel reports for landscape and flora (EPA 2002b, 2002c).

4.1.2 Vertebrate Methods

In order to gain an understanding of terrestrial vertebrates previously recorded from within the project area and surrounds, publicly accessible databases were inspected, agencies consulted and relevant reports reviewed. This included searching Osmotic Ecology's internal database, which includes several systematic trapping surveys within the project area. Searches were conducted based on the broader Surat Gas Project EIS area and included an approximate buffer of 10kms. Where possible, records older than 1980 were excluded from the study results.

This desktop component was undertaken prior to field surveys and allowed the survey team to pay particular attention to known or potential vertebrate values. It is also important when predicting the potential occurrence of priority vertebrates. Species that are known from numerous, recent, nearby records are considered more likely if suitable habitat is located.

Information sources included the Birds Australia Atlas database, the DERM WildNet and specimen records held by the Queensland Museum. Results were compiled to produce a list of species known from the local area. A search was also conducted using the Department of Environment, Heritage, Water and the Arts (DEWHA) EPBC Matters Online Database (DEWHA 2009). This database returns both known records and predictive results without any distinction. Species identified in the search are not included in the local area species list unless confirmed records are indicated in other database sources. However, the likelihood of a species indicated in the EPBC database search occurring within the project area is assessed based on habitat suitability (confirmed during field investigation) and known species range. All species indicated in the EPBC database search have been assessed on this basis.

Other publications or planning tools were also utilised as relevant. These included the Biodiversity Planning Assessment for the Brigalow Belt (EPA Version 1.3, 2008) which provided an insight into essential habitat, core conservation areas and potential biodiversity corridors.

4.2 Aerial Photograph Analysis and Survey Site Selection

A review and compilation of hard copy stereo imagery, both recent and historical, from the Queensland Department of Natural Resources, Mines and Water (DNRM&W) aerial photographic library was completed to determine the most appropriate image base for vegetation mapping and assessment purposes with the project area. **Table 1** provides a list of photographic imagery used in the assessment. Historical aerial photography was extensively utilised to assist determination of remnant and EPBC status of sensitive vegetation communities as well as provide a broad indication of past land management practices relevant to an assessment of vegetation condition. Certified RE mapping (Version 6.0, 2009) was referenced during all stages of stereoscopic assessment to provide a preliminary indication of the limitations of existing mapping as well as assisting the selection of survey site locations. At the time of this report, available digital photographic imagery did not provide comprehensive coverage of the project area although satellite imagery from google earth was consulted where necessary.

Table 1. Aerial Photographic Imagery Utilised

Map Name/ Film Number	PL/PL(A) Areas	Year	Scale	Run/ Photograph
Dalby / QAP6203	PL230 PL252 PL253 PL(260 PL238 PL198	2006	1:40 000	Run 1, 120-124 Run 2, 114-119 Run 3, 093-102 Run 4, 075-085 Run 5, 052-062 Run 6, 041-048 Run 7, 021-026 Run 8, 008-013 Run 9, 181-186
Kogan / QAP5922	PL194 PL230	2001	1:40 000	Run 1,059-062 Run 2, 085-088 Run 3, 097-096
Milmerran / QAP 6174	PL258	2005	1:40 000	Run 1, 023-029
Dalby - Millmerran	PL230 PL252 PL260 PL238 PL198	1981	1:75 250	Run 2, 128-152 Run 1, 015-027

4.3 Field Survey

Flora and vertebrate surveys were undertaken over a two-week period between 19 - 23 and 26 -30 October 2009 (inclusive). Temperature extremes ranged from 9.1°C to 33.2°C in the first week when skies were cloud free. Moderate temperatures (12°C to 29.5°C) were experienced during the second week due to substantial cloud cover. Scattered heavy showers were experienced in the region during the early stages of the second week, but few falls were greater than 5mm (Bureau of Meteorology 2009).

4.3.1 Site Selection

A suite of survey sites on various properties and tenures was chosen from an analysis of desktop information to ensure that surveys targeted those areas considered to pose a high risk in terms of significant impacts to flora species and vegetation communities. Survey sites were thus located within:

- areas designated for immediate future impact which are poorly represented in previous survey efforts;

- areas identified as possessing, or potentially possessing significant or sensitive vegetation, flora and vertebrate species, particularly in areas designated for immediate future impact; and
- areas which possess representative examples of remnant vegetation which provide reference condition for a number of sensitive vegetation communities or regional ecosystems.

Further sites were added opportunistically during the field survey to provide complete data coverage and allow mapping unit verification. The location of sample sites is indicated in **Figure 2.**

4.3.2 Flora Methods

Field survey method followed Queensland Herbarium standards as identified in Neldner *et al.* (2005) using a combination of formalised secondary, tertiary and quaternary level sampling

procedures, as well as informal site observation. A total of 86 survey sites were recorded within the project area including 30 secondary and 2 tertiary level sites and 54 quaternary sites.

Summary site descriptions are provided in **Appendix A.** Secondary survey sites consisted of a 50 m x 10 m plot located along contour with attempts made to avoid sampling across Vegetation Community (VC) boundaries. Crown intercept transects were extended to 100 m for the purpose of providing sufficient data for reference sites as required for map amendment procedure. Bitterlich measurements, as described in Grosenbaugh (1952), were used to record community basal area at all sites except in highly linear communities where the method proved inappropriate. Full species lists for all strata were established during the secondary sampling procedure wherein the 500 m^2 plot was intensively sampled followed by a detailed search of the vicinity. The abundance of all species within the plot was recorded by stem counts and by a visually assessed 1-5 cover-abundance ranking using the braun-blanquet method. Ecological and structural data together with full species lists were also recorded.

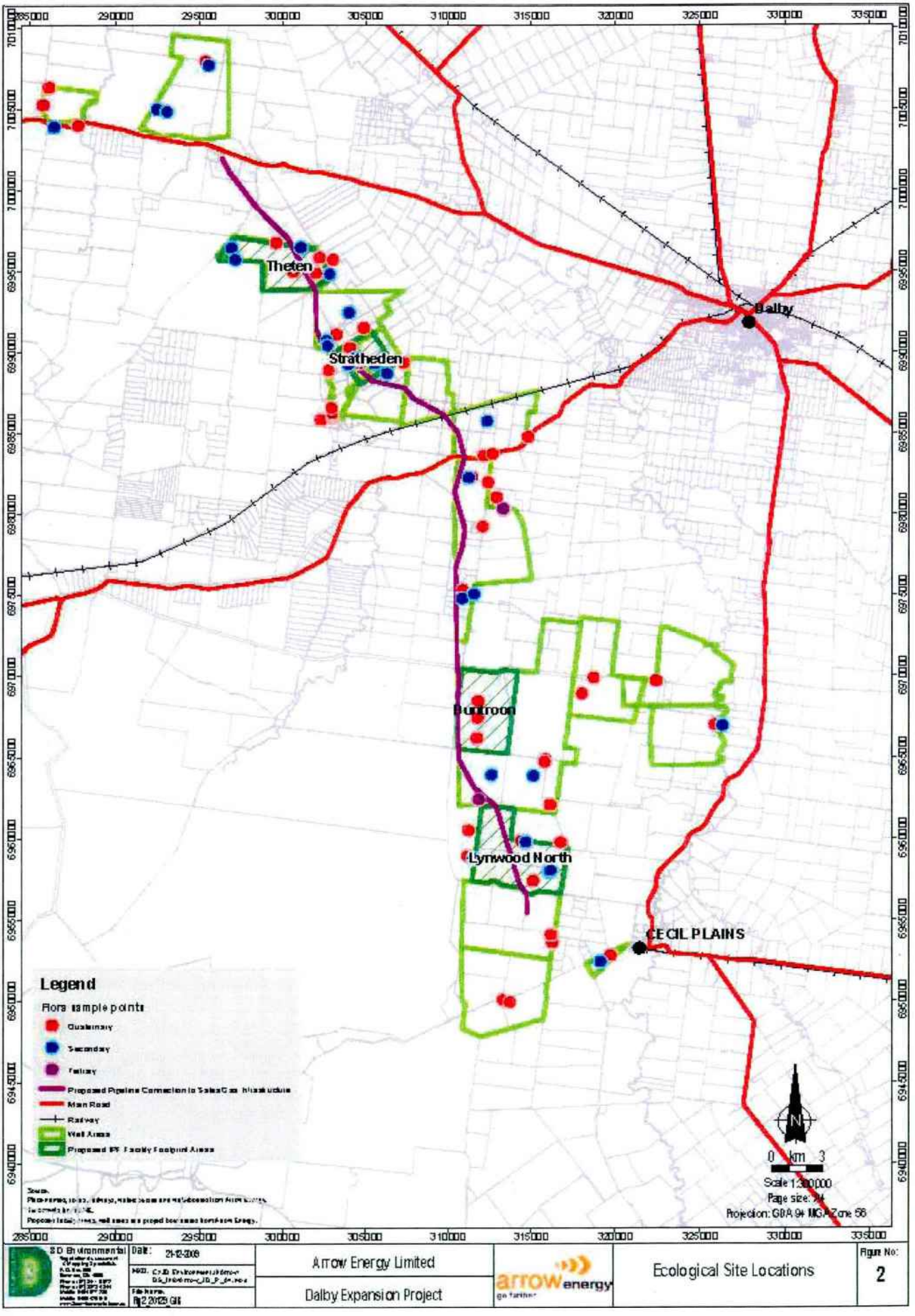
Tertiary sites were completed in a similar fashion to the secondary procedure, although non-woody species were not recorded. Quaternary sites comprised a description of floristic structure, composition, and associated landform. Wherever a VC was considered to be potential critical habitat for Endangered, Vulnerable or Rare (EVR) species, the search area was broadened and a more extensive species list was established from an extended search area. Flora species were also recorded on walking traverses again with particular attention toward EVR, exotic and locally significant taxa. Botanical voucher specimens were collected throughout the field survey to verify site floristics and enable identification of those species that were problematic.

Reference sites established in undisturbed or lightly disturbed vegetation communities within the project area form a basis from which an assessment of the remnant/non-remnant status of a specific VC or RE can be made. These sites also provide a benchmark for the assessment of VC condition and biodiversity values. Reference locations established in the flora study were chosen from aerial photography and on-ground scrutiny as areas with intact canopy signature and representative of the best preserved or 'type' example of a given VC within the project area.

4.3.3 Vertebrate Method

Vertebrate species and their habitats were assessed using rapid visual assessment methods. Survey locations were consistent with those used in the vegetation assessment allowing data consistency and matching of habitat characteristics to vegetation communities.

Within each vegetation community, notes were recorded on habitat characteristics relevant to vertebrate species such as the abundance of hollows, woody debris, ground cover density and vertical complexity. In addition, each survey location was rated for its suitability for EVR species


Theten
Stratheden
Dalby
Dulroon
Lynwood North
CECIL PLAINS
Legend
Flora sample points
Quaternary
Secondary
Tertiary
Proposed Pipeline Connection to Sales/Gas Infrastructure
Main Road
Railway
Well Areas
Proposed EP Facility Footprint Areas
N
0 km 3
Scale 1:300000
Page size: A4
Projection: GDA 94 MGA Zone 56
SD Environmental
Date: 21-12-2009
Arrow Energy Limited
Dalby Expansion Project
arrow energy
Ecological Site Locations
Figure No:
2

identified in the desktop assessment. A minimum of four photos were taken at each location for later reference and to highlight important habitat characteristics.

The collection of habitat characteristics at each vegetation community allows the results to be matched to individual vegetation communities. These values can then be extrapolated to areas not visually assessed by using the vegetation mapping produced from survey data. However, it should be noted that some important habitat characteristics cannot be predicted using this method (e.g. the presence of individual flora species important for particular vertebrates). As such, it provides a planning tool, but is not sufficiently accurate for detailed impact assessment.

Habitat assessments were supplemented by vertebrate records identified through direct observation, from call, or through noting tracks, scats and other signs. Active searching under debris such as logs, timber and bark piles facilitated the detection of vertebrates. Where present, effort was focused around features such as caves or waterbodies where vertebrate activity was likely to be high.

5. RESULTS

5.1 Desktop Review

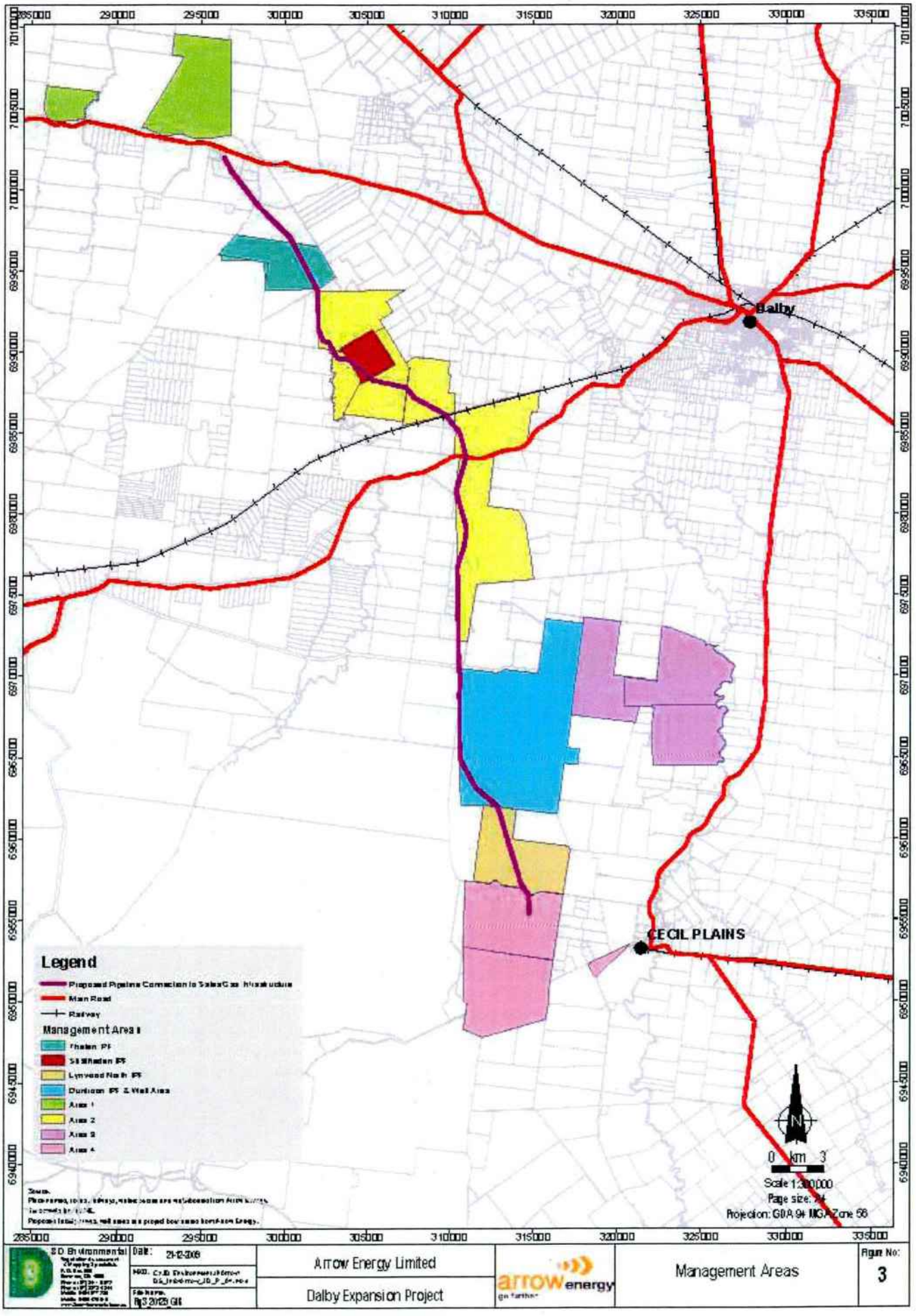
For the purposes of this report the Dalby Expansion Project Area (both facility and well areas) is sub-divided into eight units based on a combination of development priority, ecological characteristics, management requirements and location within the project area. These groups, termed Management Areas (MAs) are listed below.

1. Theten proposed IPF footprint area within PL230. This area also contains a provision for the installation of domestic supply wells.
2. Stratheden proposed IPF footprint area within PL252.
3. Duntroon proposed IPF footprint area within PL198. This area also contains a provision for the installation of domestic supply wells.
4. Lynwood North proposed IPF footprint area within PL198.
5. MA1 containing a domestic well and pilot well area within PL194.
6. MA2 containing production well and domestic well areas within PL252 and PL253.
7. MA3 containing production well and domestic well areas within PL238 and PL198.
8. MA4 containing domestic well and pilot well areas within PL258.
9. The proposed pipeline connection to sales gas infrastructure route (pipeline connection route).

Spatial representation of these groupings within the project area is illustrated in **Figure 3**.

The pipeline connection route incorporates a standard 30m wide construction corridor, although the corridor width may be significantly reduced in constrained areas.

The Stratheden area was investigated during the course of the study as a potential location for an IPF siting. At the time of this report, this option is no longer under consideration as part of the EA application, although study results and constraints mapping is provided within for completeness. Also, the Lynwood North option was investigated during this study, and has been identified as a secondary IPF siting option in the event that land negotiations to not facilitate the development of the Duntroon IPF. The results and contraints mapping generated for the Lynwood North area are also presented in this report.


Dalby
CECIL PLAINS
Legend
Proposed Pipeline Connection to Sales/Gas Infrastructure
Main Road
Railway
Management Areas
Area 1
Area 2
Area 3
Area 4
0 km 3
Scale 1:300000
Projection: GDA 94 MGA Zone 56
Arrow Energy Limited
Dalby Expansion Project
Management Areas
Figure No:
3

5.1.1 Vegetation Communities and Regional Ecosystems

EPBC Threatened Ecological Communities: A search of the EPBC database (provided in **Appendix B**) over the project area indicates the potential presence of the following threatened ecological communities:

1. Brigalow (*Acacia harpophylla* dominant and co-dominant) (Endangered);
2. Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered);
3. Weeping Myall Woodlands (Endangered); and
4. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

These communities have been correlated to mapped REs wherever possible in **Table 3.**

Regional Ecosystems: REs currently mapped within the project area are identified in **Table 2** with a summary of those ecosystems of critical importance to planning and impact assessment provided in **Table 3**. Fourteen REs are mapped in the project area with spatial representation of VMA status provided in **Appendix C.** Mapping includes representation of two endangered REs (Vegetation Management Status) with both communities similarly classified as endangered under the EPBC Act. DERMs RE mapping is presented at a scale of 1:100 000 which generally delineates polygons of >20ha and a minimum polygon size for isolated remnant vegetation as 5 hectares (ha).

High Value Regrowth: Non-remnant vegetation is mapped according to the VMS of the pre-disturbance ecosystem, categorised as regrowth derived from 'endangered','of concern', and 'least concern' REs.

Table 2. RE's identified in project area (based on desktop studies) (DERM Version 6.0, 2009).

RE	Description	Location in Project Area*
Land Zone 3 - Quaternary Alluvial Plains		
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Stratheden, MA2
11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Lynwood North, MA2, MA3, Duntroon, MA4, pipeline connection route
11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* .	Stratheden, MA2 , Duntroon, pipeline connection route
11.3.18	*Eucalyptus populnea, Callitris glaucophylla, Allocasuarina luehmannii* shrubby woodland.	Lynwood North, Duntroon, pipeline connection route
11.3.25	*Eucalyptus tereticornis* or E. *camaldulensis* woodland fringing drainage lines.	MA1, MA3, MA4, pipeline connection route
11.3.27b	Lacustrine wetland (e.g. lake).	MA2
Land Zone 4 - Flat to gently undulating Tertiary clay plains		
11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.	Lynwood North, MA2
Land Zone 5 - Tertiary Plains		
11.5.1	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces.	Lynwood North, Theten, Duntroon, MA1, MA4, pipeline connection route
11.5.1a	*Eucalyptus populnea* woodland with *Allocasuarina luehmannii* low tree layer.	Theten
11.5.4	*Eucalyptus crebra, Callitris glaucophylla, C. endlicheri, E. chloroclada, Angophora leiocarpa* on Cainozoic sand plains/remnant surfaces. Deep sands.	Lynwood North, Duntroon, pipeline connection route
11.5.20	*Eucalyptus moluccana* and/or *E. microcarpa/ E. pilligaensis* ± *E. crebra* woodland on Cainozoic sand plains.	MA2 , pipeline connection route
Land Zone 7 - Tertiary Rises		
11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus* spp.,	Theten, MA1, MA4, pipeline connection

RE	Description	Location in Project Area*
	Corymbia spp., *Acacia* spp., *Lysicarpus angustifolius* on Cainozoic lateritic duricrust.	route
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks.	MA1, pipeline connection route
11.7.7	*Eucalyptus fibrosa* subsp. *nubila* ± *Corymbia* spp. ± *Eucalyptus* spp. on Cainozoic lateritic duricrust.	MA1, pipeline connection route

* REs are assessed to occur on the pipeline connection route where they are intersected by a 30m wide construction corridor.

Table 3. REs of major significance to planning and impact assessment

RE	Bio Stat.	VM Stat.	EPBC Stat.	EPBC Community
11.3.1	Endangered	Endangered	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.3.17	Endangered	Of Concern	NA	NA
11.4.3	Endangered	Endangered	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.3.2	Of Concern	Of Concern	NA	NA
11.3.25	Of Concern	Not of Concern	NA	NA
11.3.27	Of Concern	Not of Concern	NA	NA

5.1.2 Floristic Database Searches

A summary of significant flora species identified during the searches of Federal and State databases is provided in **Table 4**. In total, 18 species listed as either Endangered, Vulnerable or Rare (EVR' are identified as potentially occurring within the project area. This list includes 12 species of National Significance under the EPBC Act and 16 species of State significance under the NCA Act. Ten species are listed on both the EPBC and NCA.

EPBC Act Online Data: Results of the online search of the EPBC Act database covering the project area revealed that 11 plants are species listed as nationally significant (Critically Endangered, Endangered or Vulnerable), which have the potential to occur in the project area.

HerbRecs: A search of the of the Queensland Herbarium's HerbRecs database (extract August, 2009) aimed to capture all vascular flora species records of vouchered specimens lodged at the Queensland Herbarium collected over the entire EIS Project including a 5 km buffer. The search returned 13,898 individual collections. The 2,100 species recorded (of which eight are gymnosperms, 30 ferns, and 2042 angiosperms) represents 15% of the Queensland flora. The flora comprises 75 EVR species and 359 species of non-native flora (17% of total flora), 27 of which are declared under the LPA Act. It is important to note that the species composition within the project area is likely to be significantly less than the database records indicate given that many of the records have a low precision factor and therefore may occur outside of the area of interest. The location of 11 HerbRecs derived EVR flora records relative to the project area is shown in **Appendix D.**

EPA WildNet Data: A search of EPA's WildNet database identified 405 terrestrial flora species as potentially present within the project area. This data set incorporates HerbRecs specimen data, CORVEG site data and may also include information from research and monitoring programs, inventory programs including extension activities, literature records, wildlife permit returns and community programs.

5.1.3 Fauna Values

Database inspection identified a total of 418 terrestrial vertebrate species within or surrounding the project area. Approximately 91.6% (383) of these species are common and not specially protected, while another 3.6% (15) are exotic species. Included within the 418 species identified

Table 4. Significant flora species - potential occurrences from datasets

Species Name	Conservation Status		H'BRECS Records within EA Area	EPBC Online	Wildlife Online	Potential Habitat	Regional Ecosystem	Preliminary Assessment of Likelihood of Occurrence
	EPBC	NCA						
Acacia chinchillensis Chinchilla Wattle	V	V	Duntroon	Yes	Yes	Flat to gently undulating plains within *Eucalyptus crebra, Callitris glaucophylla, Allocasuarina luehmannii* woodland to open forest or *Callitris glaucophylla, Allocasuarina luehmannii* open forest. Soils are deep sandy loams with sandy clay sub soils (DNR 2000).	Non-R, 11.3.18, 11.5.1, 11.5.4, 11.5.20, 11.5.21	Likely. Suitable habitat exists within the project area.
Aponogeton queenslandicus	Not listed	R	No	No	No	Permanent waterholes along Condamine and major creeks or in brigalow/belah communities, and non-remnant brigalow regrowth or pasture land alluvial soils with heavy gilgai.	11.3.1, 11.3.27d, 11.4.1, Non remnant	Likely. Suitable habitat exists within the project area.
Bothriochloa biloba Lobed Blue Grass	V*	Not listed	MA3	No	Yes	Cleared eucalypt forests and relict grassland with preference for heavier-textured soils brown or black clay soils (Bean 1999, DEWHA 2009). Qld Herbarium HerbRecs data (DERM 2009) records in Project Area are: • 2km S of Condamine River, 10km N of Cecil Plains on roadsides on Condamine flood plain *E. camaldulensis* woodland on sandy alluvium over clay; • 14km NE of Cecil Plains in *Dichanthium sericeum* grassland on heavy soil alluvium; • 6km E of Cecil Plains, in grassy rail reserve, on heavy soil alluvium.	11.3.4, 11.3.21, 11.3.25, 11.4.3, Non remnant	Likely. Suitable habitat exists within the project area.
Cadellia pentastylis Ooline	V	V	No	Yes	No	Clay plains, sandstone slopes and residual ridges in vine thickets, or in	11.7.1, 11.9.4, 11.9.5	Unlikely. No previous

Species Name	Conservation Status		H'BRECS Records within EA Area	EPBC Online	Wildlife Online	Potential Habitat	Regional Ecosystem	Preliminary Assessment of Likelihood of Occurrence
	EPBC	NCA						
						association with Brigalow, and Belah.		records in vicinity. Sub optimal habitat exists within the project area.
Dichanthium queenslandicum King Blue Grass	V*	V	No	Yes	No	Remnant and non-remnant derived grasslands on alluvium, cracking clays, and basalt. Fensham (1999) considers the taxon restricted to the Central Highlands following its extinction from southern Queensland (in Fensham 1998). Hill (2000) also considers it extinct on the Darling Downs, however more recently it has been found near Jondaryan (R.G. Silcock, unpublished data) and near Roma (W.J. Scattini, unpublished data) (in Silcock *et al.* 2007). A 1952 low precision record is known from the Jimbour Plain (DERM 2009) Silcock *et al.* (2007) consider that it may always have been near its southern ecological limit on the Darling Downs and in the Maranoa and is considered very rare on Darling Downs (TSSC 2008).	11.3.1, 11.3.2, 11.3.21, 11.4.4, 11.8.11 Non-remnant	Possible. Habitat exists within the project area.
Digitaria porrecta Finger Panic Grass	E	R	MA3	Yes	Yes	Non-remnant derived grasslands on alluvium and cracking clays, Brigalow/Belah, and Eucalypt woodlands on heavy alluvial soils.	11.3.1, 11.3.2, 11.3.21, Non-remnant	Known. Existing HerbRecs records are

Species Name	Conservation Status		H'BRECS Records within EA Area	EPBC Online	Wildlife Online	Potential Habitat	Regional Ecosystem	Preliminary Assessment of Likelihood of Occurrence
	EPBC	NCA						
								located within the project area.
Diuris tricolor (syn. *D. sheaffiana)* Spotted-throat Cowslip	V	Not listed*	No	Yes	No	Grass eucalypt woodland and open forest including *Eucalyptus populnea, E. pilligaensis*, often with *Callitris* on sandy or lateritic and landforms.	11.3.2, 11.3.18, 11.5.20	Unlikely. No records in the vicinity. Sub optimal habitat exists within the project area.
Eleocharis blakeana	Not listed	R	Lake Broad. CP	No	Yes	Swampy alluvial depressions and natural and artificial waterholes (Stanley and Ross 1989).	11.3.27d	Likely. Suitable habitat exists within the project area.
Fimbristylis vagans	Not listed	R	Lake Broad. CP	No	Yes	Swampy alluvial depressions and natural and artificial waterholes.	11.3.27d	Likely. Suitable habitat exists within the project area.
Homopholis belsonii	V	E	No	Yes	Yes	HerbRecs record 4km east of Dalby, in *Casuarina cristata* and *Acacia melvillei* vegetation on grey to black alluvial soils.	11.3.1, 11.3.2, 11.3.17	Possible. Suitable habitat exists within the project area.
Philotheca sporadica	V*	V	MA1	Yes	Yes	Rocky lateritic and sandstone rises and low ridges in mixed *Eucalypt/Callitris* woodlands including *Eucalyptus fibrosa* subsp. *nubila, E. crebra, E. exserta, Allocasuarina luehmannii, Callitris glaucophylla,* and *Corymbia trachyphloia.*	11.7.4,	Likely. Suitable habitat exists within the project area.
Picris evae Hawkweed	V	V*	No	Yes	Yes	*Eucalyptus* open grassy woodland, *Dichanthium sericeum* grassland, and non-remnant roadsides,	11.3.21, 11.8.5, Non-remnant	Possible. Suitable habitat exists

Species Name	Conservation Status		H'BRECS Records within EA Area	EPBC Online	Wildlife Online	Potential Habitat	Regional Ecosystem	Preliminary Assessment of Likelihood of Occurrence
	EPBC	NCA						
						paddocks and cultivated areas (DECC 2005a).		within the project area.
Rhaponticum australe	V	V*	No	Yes	No	Eucalypt open forest with grassy understorey on roadsides and on road reserves, and *Eucalyptus tereticornis* and *Angophora floribunda* on black clay soil (BRI collection records, n.d.).	11.3.21, 11.8.5, Non-remnant.	Unlikely. No records in vicinity. Sub optimal habitat exists within the project area.
Solanum papaverifolium	Not listed	E	MA3	No	Yes	Heavy clay soils in grassland or Eucalypt woodlands (Bean 2004).	11.3.2, 11.3.21, Non-remnant.	Likely. Suitable habitat exists within the project area.
Solanum stenopterum	Not listed	V	No	No	Yes	Grassland, *Casuarina cristata* open forest, or *Eucalyptus populnea* woodland on clay soils (Bean 2004).	11.3.1, 11.3.2, 11.3.17, 11.3.21	Likely. Suitable habitat exists within the project area.
Thesium australe	V	V	No	Yes	Yes	Roadside remnant and non-remnant grasslands and *Eucalyptus populnea* grassy woodlands on heavy soil alluvium.	11.3.2, 11.3.21, Non-remnant.	Possible. Suitable habitat exists within the project ares.
Tylophora linearis	E	E*	No	Yes	No	Eucalypt and Callitris woodlands (Forster *et al.* 2004).	11.5.1, 11.7.4, 11.10.1d	Unlikely. Known record located at Glenmorgan well west of project area.
Zornia pallida	Not listed	R	No	No	No	Eucalypt woodlands and disturbed areas (Reynolds and Holland 1989).	Unknown.	Unlikely

are three Endangered, five Vulnerable and 12 Rare species under the NCA. Two Endangered and three Vulnerable species are also listed under the EPBC Act. Listed species known from the local area are provided in **Table 5**. A complete list of species identified within the database search is provided in **Appendix E** with spatial representation of fauna records illustrated in **Appendix F.**

A number of EVR species were also identified within the EPBC online database. This database includes predictive results based on the possible presence of habitat and the species distribution. Records within this database may not reflect actual observations or specimens. Search results from the EPBC online database are provided in **Appendix B.**

Twenty-three birds known from the project area are listed as Migratory under the EPBC. The bulk of these species are wetland/water species, whose distribution within the local area is likely to be restricted or heavily influenced by Lake Broadwater. All species are common within the local area with the exception of Cotton Pygmy-goose, Regent Honeyeater and Rufous Fantail. The latter species occurs in small numbers within the area however is not threatened. Cotton Pygmy-geese and Regent Honeyeaters are listed under legislation and discussed in **Section 5.2.5**.

Table 5. EVR Vertebrates recorded from within the project area and surrounds.

GROUP		Status		Data Source		
Scientific Name	**Common Name**	**NCA**	**EPBC**	**QM**	**WN**	**BA**
AMPHIBIANS						
Cyclorana verrucosa	Rough Frog	R	-	1	22	-
REPTILES						
Strophurus taenicauda	Golden-tailed Gecko	R	-	1	5	-
Anomalopus mackayi	Five-clawed Worm Skink	E	V	1	1	-
Acanthophis antarcticus	Common Death Adder	R	-	1	2	-
Furina dunmalli	Dunmall's Snake	V	V	-	2	-
Hemiaspis damelii	Grey Snake	E	-	1	13	-
BIRDS						
Stictonetta naevosa	Freckled Duck	R	-	-	6	2
Nettapus coromandelianus	Cotton Pygmy-goose	R	-	-	8	13
Rostratula australis	Australian Painted Snipe	V	V	-	20	6
Ephippiorhynchus asiaticus	Black-necked Stork	R	-	-	20	6
Accipiter novaehollandiae	Grey Goshawk	R	-	-	1	1
Lophoictinia isura	Square-tailed Kite	R	-	-	6	5
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	-	7	6
Lophochroa leadbeateri	Major Mitchell Cockatoo	V	-	-	1	-
Neophema pulchella	Turquoise Parrot	R	-	-	11	2
Grantiella picta	Painted Honeyeater	R	-	-	2	-
Melithreptus gularis	Black-chinned Honeyeater	R	-	-	1	1
Anthochaera phrygia	Regent Honeyeater	E	E	-	8	2
MAMMALS						
Dasyurus maculatus	Spotted-tailed Quoll	V	E	-	2	-
Chalinolobus picatus	Little Pied Bat	R	-	-	7	-

# Represented by the number of records within each database
E = Endangered; V = Vulnerable; R = Rare; C = Common or Least Concern; M = Migratory
QM= Queensland Museum, WN = Wildnet, BA = Birds Australia

5.1.4 Environmentally Sensitive Areas

Spatial representation of Category A and Category B ESAs as defined in the Environmental Protection Regulation (2008) and codes of compliance for mining and petroleum tenures are provided in **Figure 4**. Lake Broadwater, located within PL 260, provides the sole representation of a Category A ESA in the project area. Lake Broadwater is listed on the Directory of Important Wetlands and is recognised as significant at a national and state levels being a rare example of a semi-permanent freshwater lake in the bioregional area (Environment Australian 2001a, Blackman

et al. 1999). Furthermore, the lake supports a seasonally rich aquatic flora and a diverse fauna (Scott *et al.* 1988). A host of EVR species have been recorded from Lake Broadwater and in surrounding vegetation including holarctic water bird breeding species protected under CAMBA (China-Australia Migratory Bird Agreement) and JAMBA (Japan-Australia Migratory Bird Agreement) as identified in Blackman *et al.* (1999).

Category B ESAs in the project areas are restricted to REs with a Bio-diversity status of Endangered as previously referenced in **Table 3**.

Category C ESAs apply to regulation of Level 2 petroleum industries although specific conditions may apply when conducting Level 1 ERAs within these areas. Category C ESAs include the following:

- Of Concern (biodiversity status).
- Declared catchment areas.
- Resources Reserves.
- Nature Refuges.
- River improvement areas.
- State forests.

A number of State Forests fringe the project area including Braemar State Forest and Kumbarilla adjacent to the proposed Theten and Duntroon IPFs respectively. The entire project area falls within a River Improvement Area. Category C ESAs are shown in **Figure 5.**

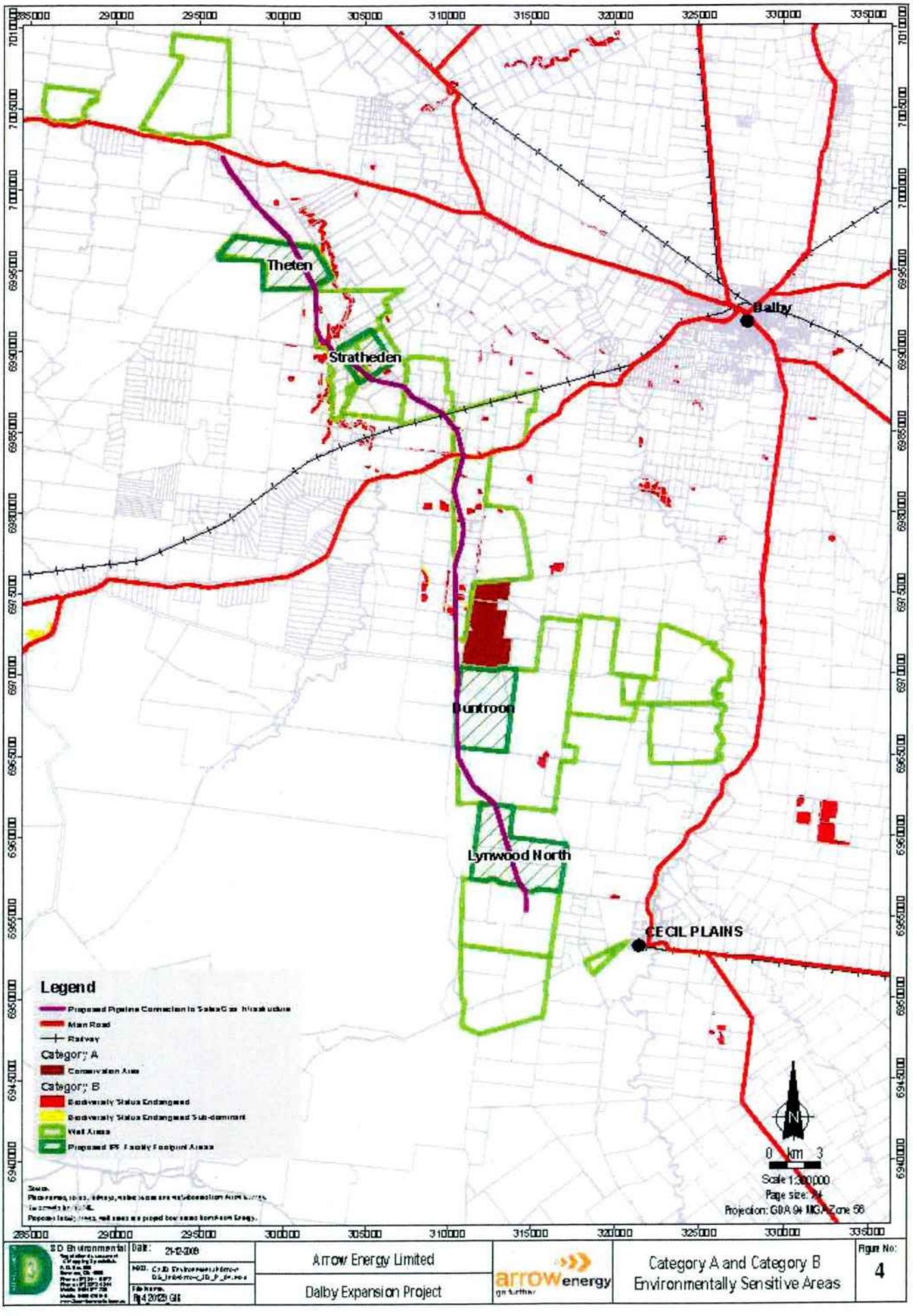
5.1.5 Biodiversity Values

The biodiversity significance and values of the Brigalow Belt South Bioregion are identified in Biodiversity Planning Assessments prepared by the DERM (EPA 2008). In relation to the project area, state, regional and local significance and special biodiversity values are assigned to the following features listed below:

- Lake Broadwater. Identified as possessing ecological values of State Significance under Criteria Ib (Special biodiversity values – wildlife refugia).
- All riparian vegetation in fragmented sub-regions (remnant threshold <30%) under Criteria Ib (special biodiversity values - fragmented landscapes). This includes the Condamine River and Wilkie Creek which traverse the project area.
- All vegetation intersecting rivers on 250,000 scale base mapping are classified as Bio-regional corridors of State Significance (under Criteria J - Corridors). This includes the Condamine River and Wilkie Creek which traverse the project area.
- The Barakula area is recognised as one of 14 core areas for biodiversity within the bioregion. This area is part of a remnant area (approx 285 000 ha) with the following endemic and disjunct taxa and localised endemics: *Acacia barakulensis, Calytrix gurulmundensis, Micromyrtus patula*; disjunct endemics *Apatophyllum teretifolium, Eucalyptus pachycalyx* subsp. *waajensis, Homoranthus decumbens, Eucalyptus rubiginosa*; mallee *E. curtisii;* and disjunct populations of *Melaleuca groveana* and *Diuris tricolor* (EPA 2002), and
- The Gurulmundi area is recognised as containing special biodiversity values based upon high floral species diversity, endemism, EVR taxa. These include three localised endemics (*Micromyrtus carinata,* (E) *Calytrix gurulmundensis* (V), *Acacia curranii* (V)); 1 disjunct endemic (*Acacia tenuinervis* (R)); and disjunct populations of *Indigofera baileyi* (R) (EPA 2002).

A Biodiversity Assessment of the Brigalow South Bioregion (DEWHA 2002) provides additional information relevant to the assessment of regional biodiversity values. Of particular note are assessments for the Eastern Darling Downs sub-region which identifies the following special biodiversity values features listed below:

- The sub-region indicates records of 56 Endangered or Vulnerable species; 76% of ecosystem types are listed as endangered or vulnerable, and; has the greatest number of ecosystems (5) which are endemic to the sub-region.
- Habitat for a number of rare and threatened flora species including *Dodonea macrossani, Acacia chinchillensis,* and *Corymbia bloxsomei* is provided in RE11.5.1
- Regional Ecosystem 11.3.21 provides habitat for rare and threatened species including *Thesium australe, Picris evae, Stemmacantha australis, Dichanthium queenslandicum, Bothriochloa biloba, Digitaria porrecta,* Grassland Earless Dragon (*Tympanocryptis pinquicolla*), *Anomalopus mackayi* and Grey Snake (*Hemiaspis signata*).
- Regional Ecosystem 11.8.8 which represents the northern limit of a temperate vegetation type extending south to Victoria and has been extensively cleared throughout its geographical range. The ecosystem provides habitat for *Muellerina myrtifolia, Indigofera baileyi, Discaria pubescens, Cryptocarya floydii* and *Acacia brunioides* subsp. *brunioides.*
- Regional Ecosystem 11.3.2 which provides habitat for rare and threatened species including *Homopholis belsoni.*Regional Ecosystem 11.3.1 which provides habitat for rare and threatened species including *Painted Honeyeater* (*Grantiella picta*).


Theten
Stratheden
Dalby
Puntroon
Lynwood North
CECIL PLAINS
Legend
Proposed Pipeline Connection to Santos Gas Infrastructure
Main Road
Railway
Category A
Conservation Area
Category B
Biodiversity Status Endangered
Biodiversity Status Endangered Sub-dominant
Well Areas
Proposed PP Facility Footprint Areas
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Dalby Expansion Project
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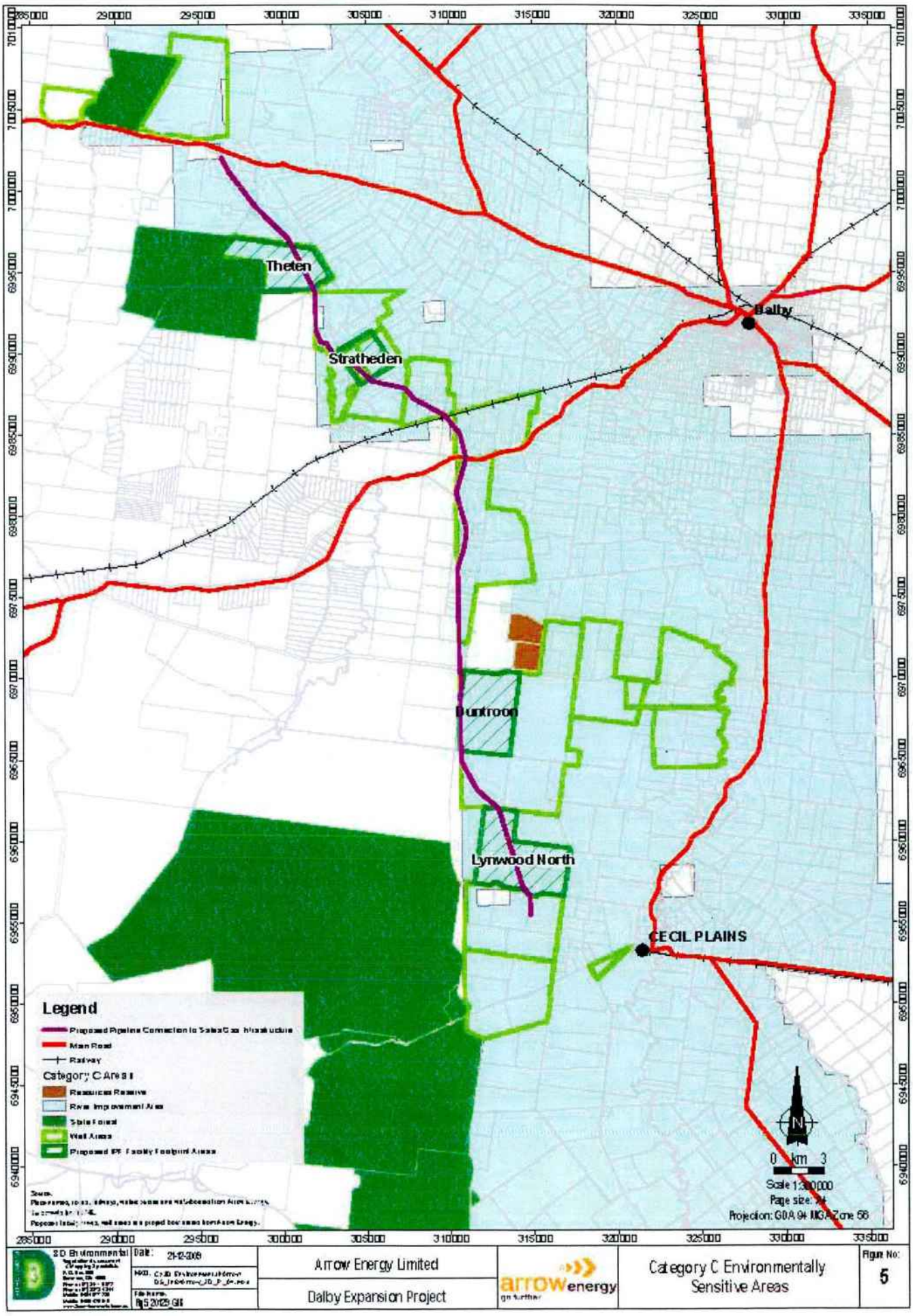
Category A and Category B Environmentally Sensitive Areas
Figure No:
4


Theten
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Duntroon
Lynwood North
CECIL PLAINS
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Scale 1:300000
Projection: GDA 94 MGA Zone 56
Arrow Energy Limited
Dalby Expansion Project
Category C Environmentally Sensitive Areas
Figure No:
5

5.2 Field Survey

The environmental values observed during field survey are described in accordance with the eight MAs identified in **Section 5.1.** A number of MAs identified as containing values critical to environmentally sensitive facility location and planning have been mapped in detail. These MAs include the following:

- Stratheden.
- Theten.
- Duntroon.
- Lynwood North.
- MA2.
- MA3.

MA1 and MA4, although containing well-developed tracts of remnant vegetation, have not been mapped in detail due to an absence of sensitive ecosystems or habitats within MA boundaries identified during desktop assessment or field survey. In these areas, observations regarding the extent of remnant vegetation, conservation status have been made and detailed mapping in these areas will be forthcoming in future EIS works associated with the Surat Gas Project. The landform associations within these unmapped areas (being typically Land Zones 5, 7, 9 and 10), provide confidence that REs critical to environmental planning (i.e. those with a Vegetation Management Status and Biodiversity Status of endangered or of concern) are not likely to be present, being more commonly associated with alluvial systems and heavy clays (Land Zone 3 and 4). A summary of known significant environmental values (constraints) and attributes for each area is provided in **Appendix G** with constraints on the proposed pipeline connection to sales gas infrastructure provided in **Appendix H**. These tables should be used as a guide for environmental licensing purposes.

5.2.1 Vegetation Communities and Regional Ecosystems Observed

EPBC Threatened Ecological Communities: The community 'Brigalow' (*Acacia harpophylla* dominant and co-dominant) scheduled as endangered under the EPBC Act is identified within in the project area. The community encompasses REs 11.9.5, 11.4.3 and 11.3.1 as well as a number of advanced regrowth brigalow communities determined as greater than 15 years old as per guidelines of Environment Australia (2001b). Classification of regrowth is determined through examination of historical aerial photography.

The community was identified within MA2, Theten, Stratheden and Lynwood North and pipeline connection route. The location of EPBC Significant communities in these areas is identified in **Figures 6a** and **6b**

Regional Ecosystems: **Table 6a** identifies 19 REs within the project area with **Table 6b** providing information on non-remnant vegetation categories. Of these, seven REs identified in **Table 7** have special conservation significance. The spatial distribution of observed REs in selected MA's is provided in **Figures 7a and 7b** with vegetation status (VMS) provided in **Figures 8a** and **8b.** DERM RE mapping (Version 6.0, 2009) is provided in **Appendix I** for areas of proposed impact (including the pipeline connection route) where detailed mapping was not undertaken.

Table 6a. Regional ecosystems observed in the project area

RE	Description	Location in Project Area*
Land Zone 3 - Quaternary Alluvial Plains		
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Stratheden, Lynwood North, MA2
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Lynwood North, Duntroon, MA2 , MA4, pipeline connection route
11.3.4	*Eucalyptus tereticornis and/or Eucalyptus spp. tall*	MA2, MA3, pipeline connection

RE	Description	Location in Project Area*
	woodland on alluvial plains	route
11.3.14	*Eucalyptus spp., Angophora* spp., *Callitris spp.* woodland on alluvial plains.	Theten, Stratheden, MA2
11.3.17	*Eucalyptus populnea* woodland with *A. harpophylla* and/or *Cas. cristata* on alluvial plains.	Stratheden, MA2, MA3, pipeline connection route
11.3.18	*Eucalyptus populnea, Callitris glaucophylla, Allocasuarina luehmannii* shrubby woodland on alluvium.	Lynwood North, pipeline connection route
11.3.25/11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
11.3.26	*Eucalyptus moluccana* or *E. microcarpa* woodland to open forest on margins of alluvial plains.	Lynwood North
11.3.27d	Palustrine wetland *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2 , pipeline connection route
Land Zone 4 - Flat to gently undulating Tertiary clay plains		
11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.	MA2
Land Zone 5 - Tertiary Plains		
11.5.1	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces.	Duntroon , MA4, Lynwood North, pipeline connection route
11.5.1a	*Eucalyptus populnea* woodland with *Allocasuarina luehmannii* low tree layer.	Duntroon, pipeline connection route
11.5.20	*Eucalyptus moluccana* and/or *E. microcarpa/E. pilligaensis* ± *E. crebra* woodland on Cainozoic sand plains.	MA2 pipeline connection route
Land Zone 7 - Tertiary Rises		
11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* on Cainozoic lateritic duricrust.	MA 1, Duntroon , MA4, Lynwood North, pipeline connection route
Land Zone 9 – Fine Grained Sedimentary Rocks		
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	Lynwood North
11.9.7	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks.	Theten
11.9.9	*Eucalyptus crebra* woodland on fine-grained sedimentary rocks.	Theten
11.9.9a	*Eucalyptus albens* ± *E. crebra* ± *E. tereticornis* ± *Callitris baileyi* woodland. Occurs in southern part of bioregion.	Lynwood North, MA1
11.9.13	*Eucalyptus moluccana* or *E. microcarpa* or *E. pilligaensis* open-forest. *Allocasuarina luehmannii* can be present in understorey. Occurs on Cainozoic to Proterozoic consolidated, fine-grained sediments. Lower slopes.	Theten
Land Zone 10 – Coarse Grained Sedimentary Rocks		
11.10.1d	*Eucalyptus crebra* woodland.	Theten, MA1

* REs are assessed to occur on the pipeline connection route where they are intersected by a 30m wide construction corridor.

Table 6b. Non-remnant vegetation classifications observed in the project area.

Non – Remnant Classifications		
Brig_small	Isolated brigalow stands (with remnant structure) of less than 1ha in total area	Theten, MA2
Der_grass.	Derived mixed native/ exotic grassland	MA3
Re_brig.	Regrowth brigalow (>15yrs old)	MA2, pipeline connection route

Non – Remnant Classifications		
Re_pop.	Regrowth *Eucalyptus populnea* + /- *Casuarina cristata* shrubland and low woodland	All Areas, pipeline connection route
Re_und.	Undifferentiated regrowth	All Areas
Re_iron.	Regrowth *Eucalyptus crebra* woodland	MA1, Theten, Duntroon , MA4
Re_pil.	Regrowth *Eucalyptus pilligaensis* shrubland	Duntroon
Re_cas.	Regrowth *Allocasuarina leuhmannii* shrubland	Duntroon, pipeline connection route
Re_und.	Undifferentiated regrowth	All Areas
Cl.	Cleared and Pastoral Areas	All Areas

Table 7. Regional ecosystems of major significance to planning and impact assessment observed in the project area,

RE	Bio Status*	VM Status**	EPBC Status	EPBC Community
11.3.1	Endangered	Endangered	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.3.17	Endangered	Of Concern	NA.	NA
11.4.3	Endangered	Endangered	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.9.5	Endangered	Endangered	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.3.2	Of Concern	Of Concern	NA	NA
11.3.4	Of Concern	Of Concern	NA	NA
11.3.25	Of Concern	Not of Concern	NA	NA
11.3.27	Of Concern	Not of Concern	NA	NA

* Subjective assessment of habitat sensitivity allocated by the EPA for Biodiversity Planning Purposes
** As per VMA, 1999.

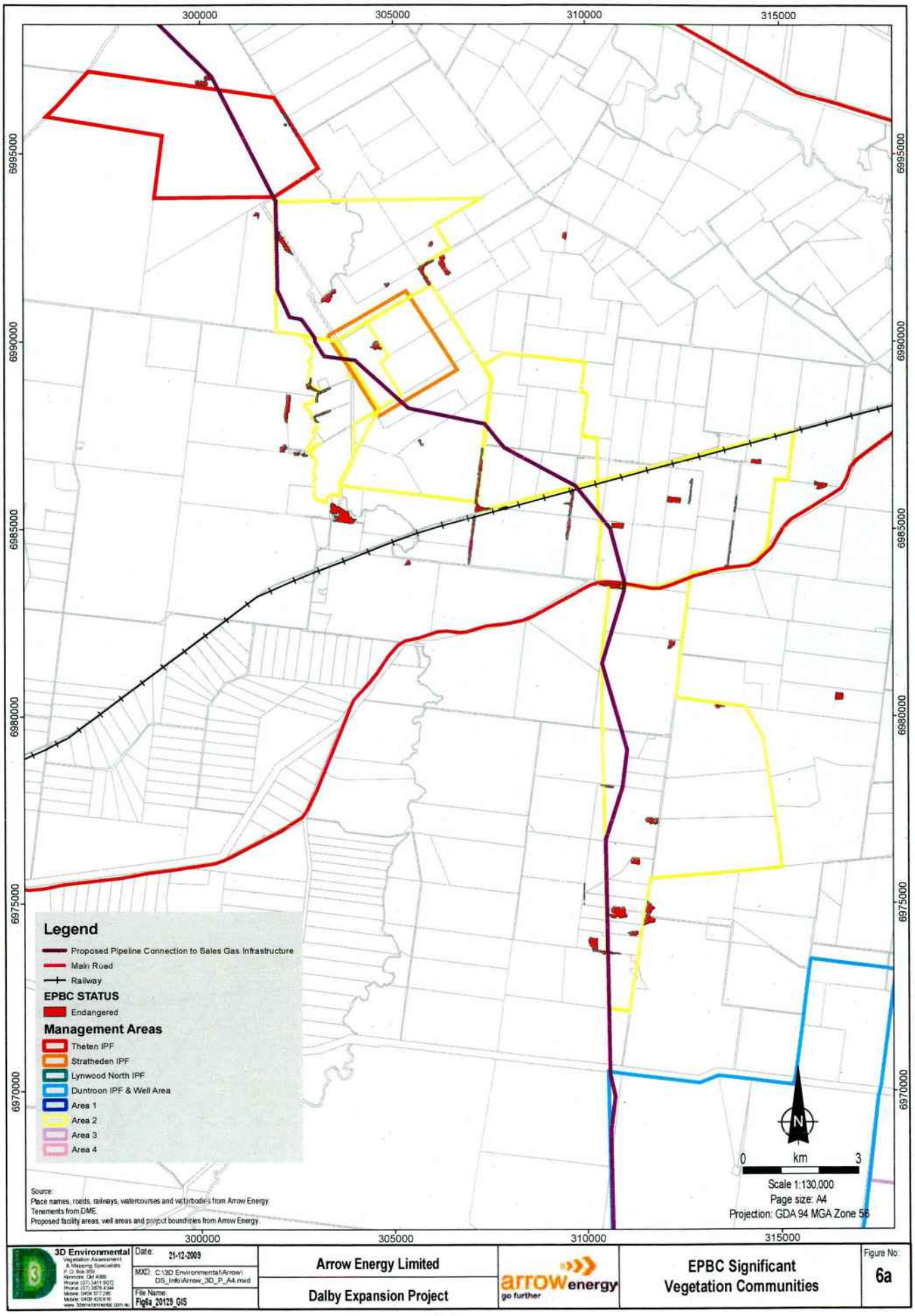
5.2.2 Other Significant Communities and Ecosystems

Derived Mixed Native/ Exotic Grasslands: The flood plain of the Condamine River, particularly in MA3, contains a number of grassy fragments which formed as a result of ring barking and clearing of former grassy woodland communities. Although these areas are non-remnant vegetation by definition, the soil structure is preserved to a degree that viable habitats for a range of EVR flora and vertebrate species are provided. The ecological values of these derived habitats and management recommendations for these areas are discussed in following sections with their distribution previously provided in **Figure 7b.**

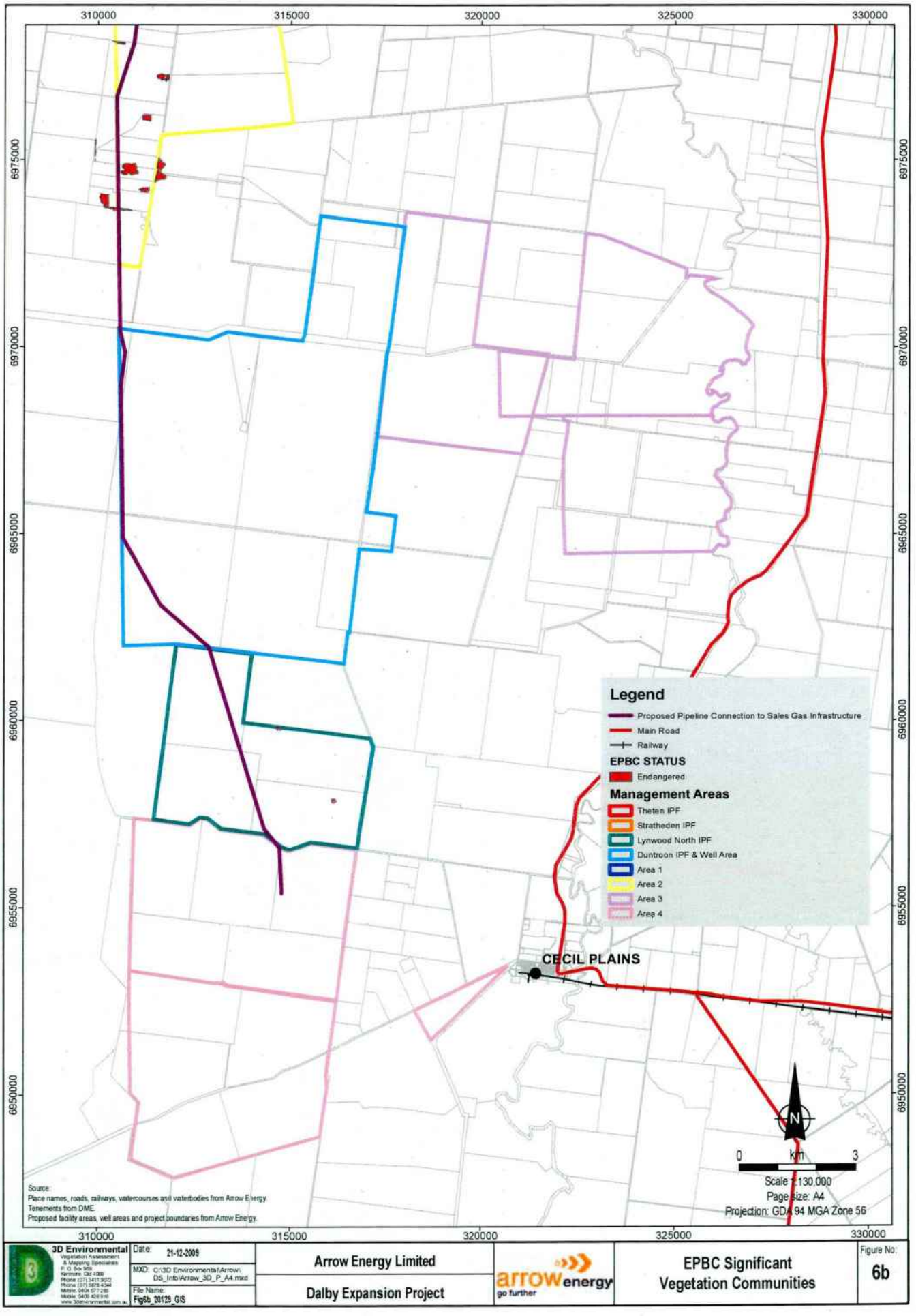
Regrowth Open Forests and Woodlands: Fragmented slivers of vegetation are common on roadside reserves where their occurrence as regrowth communities comprising a range of secondary trees and shrubs may be too narrow to be represented in the remnant vegetation coverage. Roadside fragments are most common on heavy clay soils within MA2 and MA3. Field observation suggests that these fragments may provide important movement corridors for a variety of vertebrates including selected EVR species. For example, small fragments and roadside vegetation has a tendency to contain abundant Mistletoe (Norton and Smith 1999, Bowen *et. al.* 2009), an important habitat component for the Painted Honeyeater (Higgins *et al.* 2001, Oliver *et al.* 2003, Barea 2008).

5.2.3 Condition of Habitats

The project area centres on the broad alluvial plain of the Condamine River and its associated tributaries. The productivity of the alluvial clay soils on the flood plain has resulted in heavy utilisation of these areas for agricultural purposes (predominantly tilled cropping) and remnant vegetation is largely restricted to narrow discontinuous strips along roadsides, or as isolated fragments on soils of less favourable physical properties. Continuous tracts of remnant vegetation



3D Environmental Vegetation Assessment & Mapping Specialists P. O. Box 359 Kenmore Qld 4069 Phone (07) 3411 9072 Phone (07) 3878 4344 Mobile 0404 577 295 Mobile 0409 426 916 www.3denvironmental.com.au	Date: 21-12-2009 MXD: C:\3D Environmental\Arrow\DS_Info\Arrow_3D_P_A4.mxd File Name: Fig6a_20129_GIS	Arrow Energy Limited Dalby Expansion Project	arrowenergy go further	EPBC Significant Vegetation Communities	Figure No: 6a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Main Road
Railway
EPBC STATUS
Endangered
Management Areas
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Stratheden IPF
Lynwood North IPF
Duntroon IPF & Well Area
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Area 2
Area 3
Area 4
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Projection: GDA 94 MGA Zone 56
Source:
Place names, roads, railways, watercourses and waterbodies from Arrow Energy.
Tenements from DME.
Proposed facility areas, well areas and project boundaries from Arrow Energy.
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Vegetation Assessment & Mapping Specialists
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EPBC Significant Vegetation Communities
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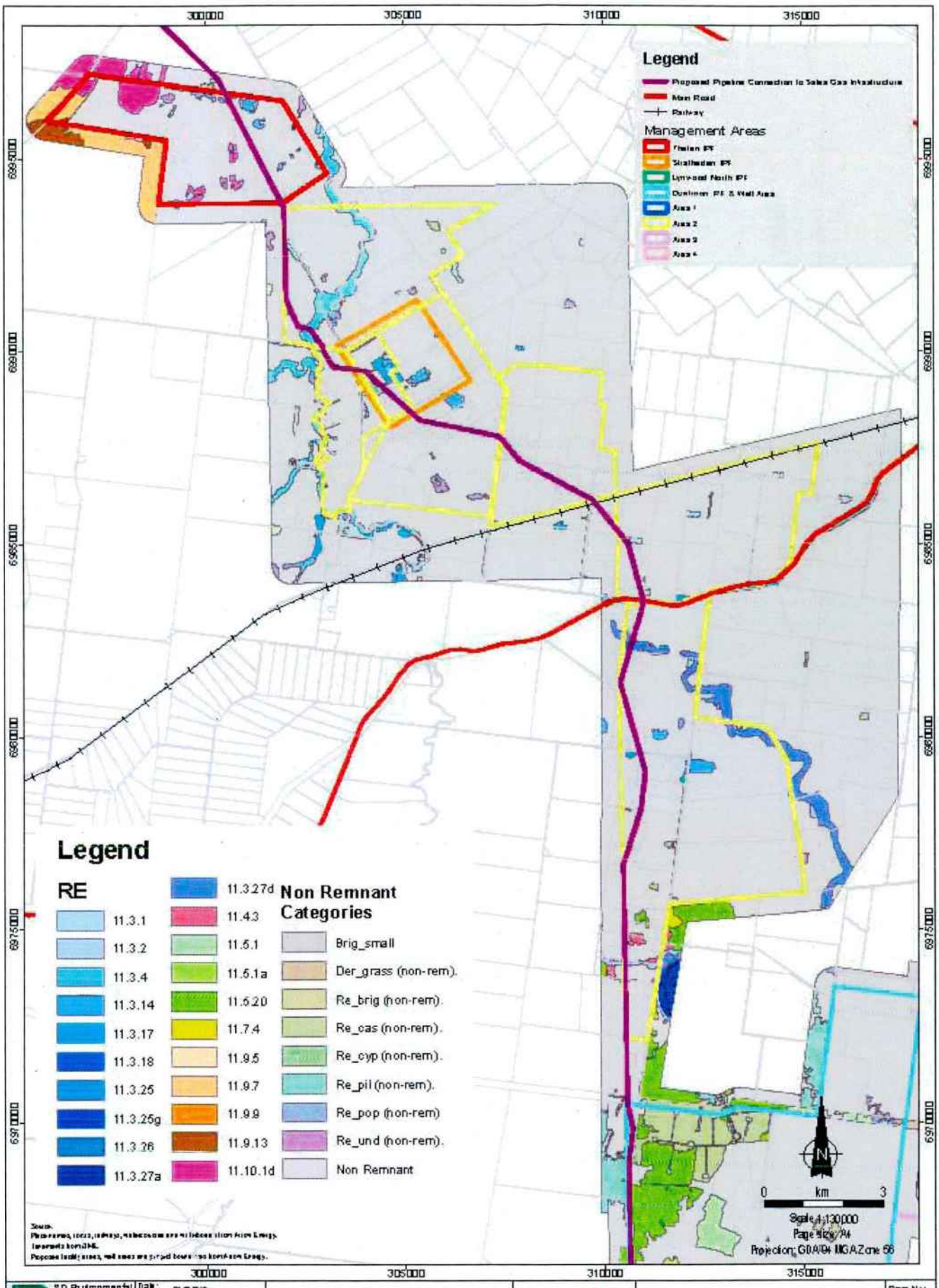
6b



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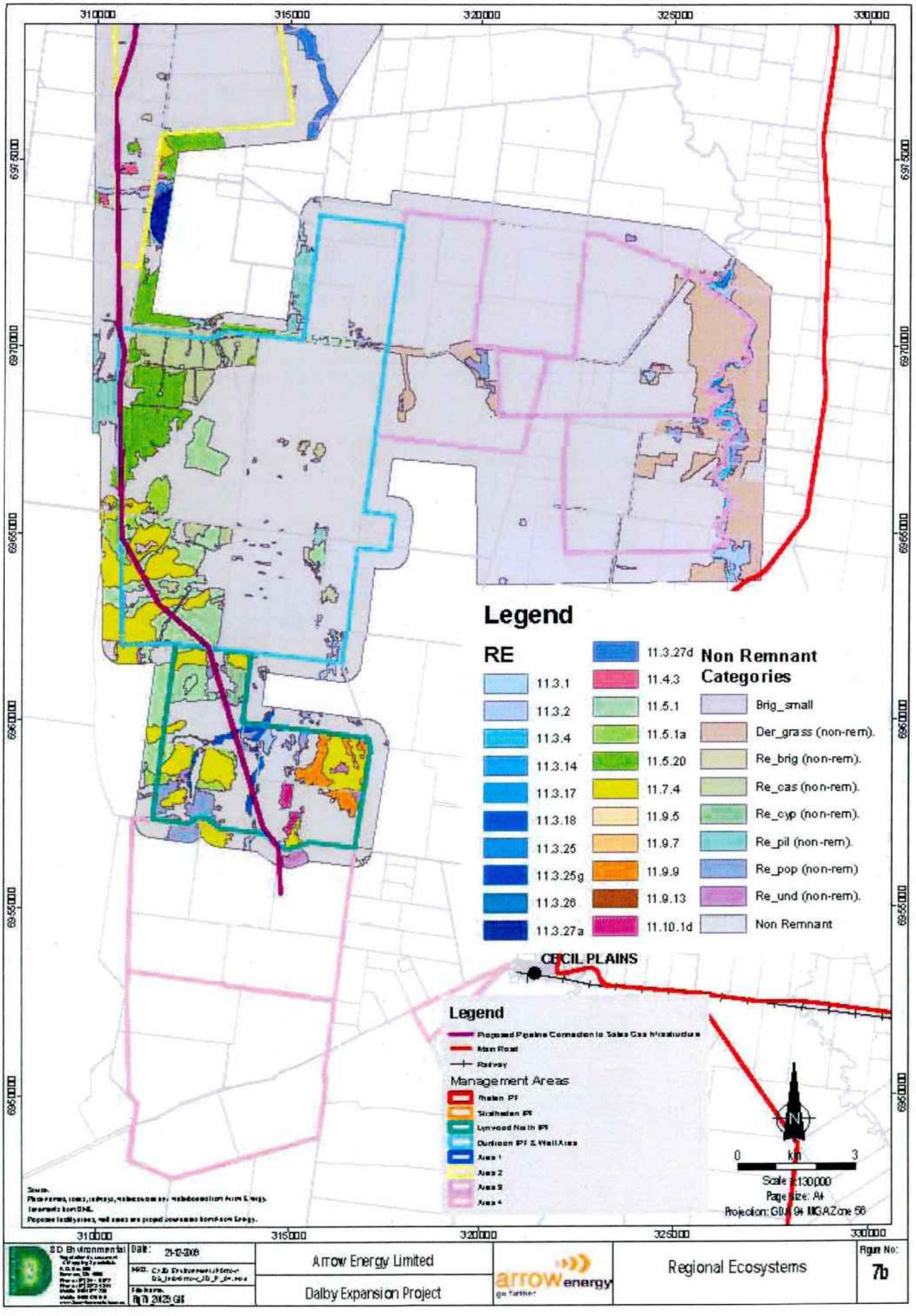
		Dalby Expansion Project		Figure No: 7a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11.3.25
11.3.25g
11.3.26
11.3.27a
11.3.27d
11.4.3
11.5.1
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11.7.4
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11.10.1d
Non Remnant Categories
Brig_small
Der_grass (non-rem).
Re_brig (non-rem).
Re_cas (non-rem).
Re_cyp (non-rem).
Re_pil (non-rem).
Re_pop (non-rem)
Re_und (non-rem).
Non Remnant
CECIL PLAINS
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Proposed Pipeline Connection to Sales Gas Infrastructure
Main Road
Railway
Management Areas
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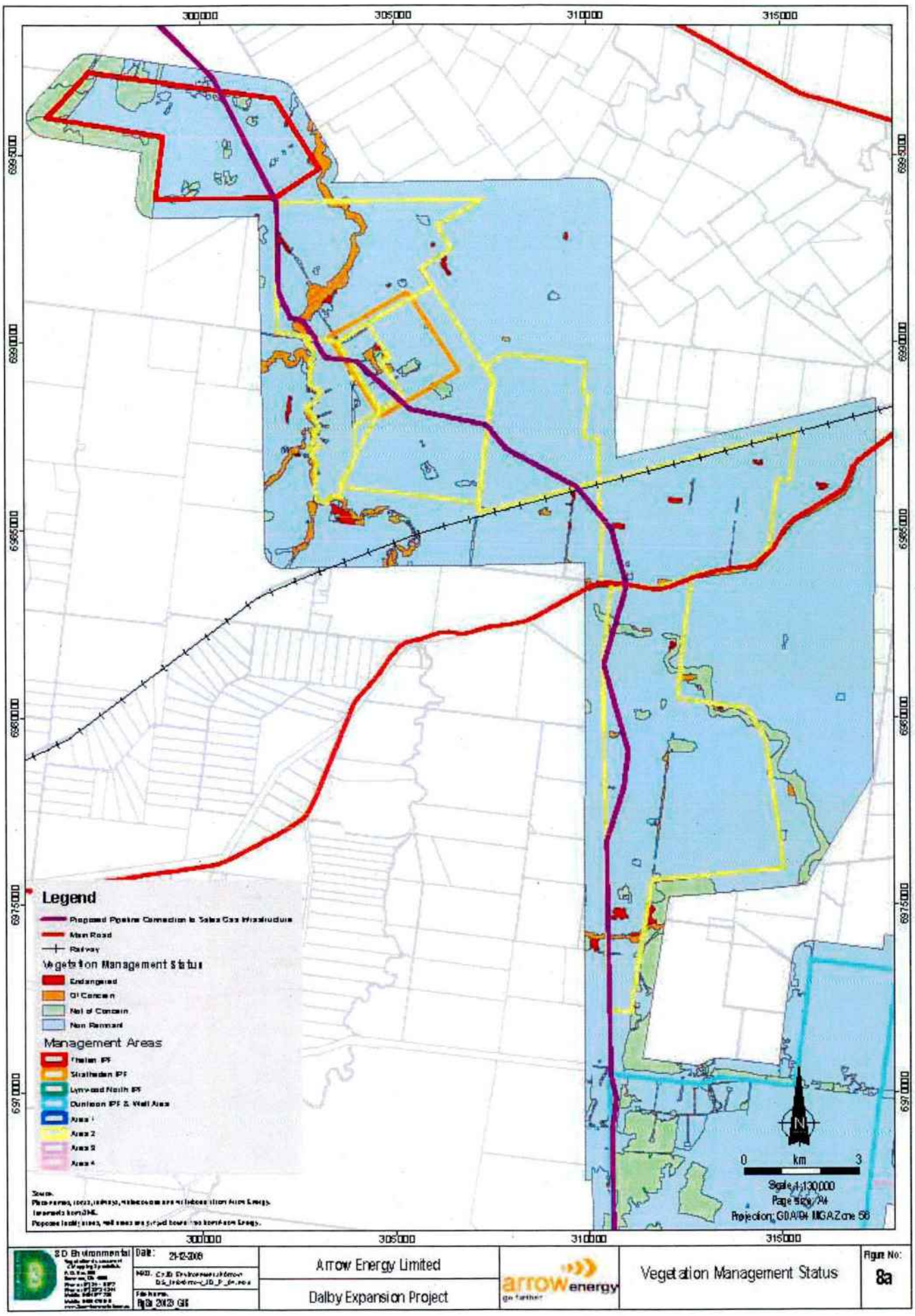
Regional Ecosystems
Figure No:
7b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Proposed Pipeline Connection to Talinga Gas Infrastructure
Main Road
Railway
Vegetation Management Status
Endangered
Of Concern
Not of Concern
Non Remnant
Management Areas
Thelan IPF
Strathdon IPF
Lynwood North IPF
Dunloon IPF & Well Area
Area 1
Area 2
Area 3
Area 4
N
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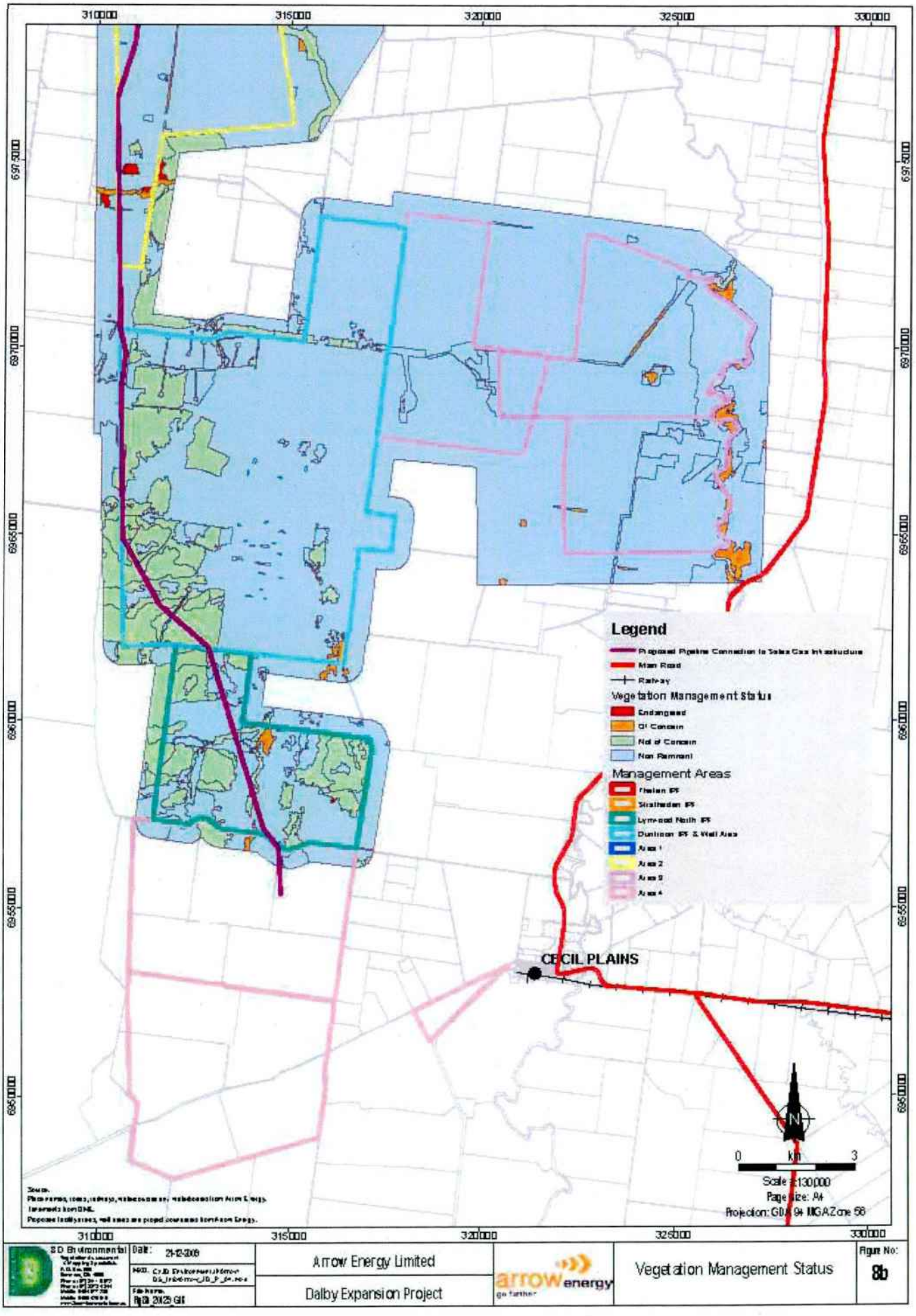
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Lynwood North IPS
Dunlicon IPS & Well Area
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Projection: GDA 94 MGA Zone 56
Source:
Place names, roads, railway, watercourses and waterbodies from Arrow Energy.
Tenements from DNR.
Proposed facility areas, well areas and proposed pipelines from Arrow Energy.
SD Environmental
Date: 21-12-2009
File Name:
Rpt 2025 Gll
Arrow Energy Limited
Dalby Expansion Project
arrow energy
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Vegetation Management Status
Figure No:
8b

associated with Braemar and Kumbarilla State Forests to the west intrude into the project area notably in the Lynwood North, Duntroon and Theten IPF footprint areas, and also in the well areas associated with MA1 in the north of the project area. Some key features relating to the condition of vegetation in the project area are described below.

1. Although ecosystem types on soils of low fertility, typically those REs associated with land zones 5, 7, 9 and 10, form the largest and most continuous tracts of vegetation in the project area, these ecosystems have invariably been heavily utilised for their timber resources with varying impacts. The most heavily disturbed examples of RE11.5.1 and 11.7.4 occur in the western portion of the Lynwood North and the Duntroon areas. These have been logged to a degree that all mature canopy trees have been removed and vegetation comprises secondary growth with a thickened shrub layer often forming the canopy. Examination of 1981 aerial photography for the project area demonstrates closely spaced rip-lines through large areas of remnant vegetation indicating the intensity of historical timber extraction practices. Similar heavy logging regimes are evident in the Braemar State Forest adjacent to the Theten area.

   Logging in other locations has been less severe (e.g. within MA1). While some canopy elements have been lost, others remain scattered through the community and the thinning of *Callitris* has prevented it forming a monoculture. The resulting mosaic of open grass interspersed between clumps of shrubs, such as observed at Sites AS22 and AQ66, offers good habitat for vertebrates. Recent activity associated with construction of gas wells has resulted in fragmentation within some of these woodland ecosystems (see **Photograph A1, Appendix J**).

   With the exception of extremely heavily logged areas, these REs do provide habitat for vertebrate species. Areas where grazing has been excluded, or is minor, retains a ground cover mosaic of native grasses, loose soil, leaf litter and abundant fallen debris. Threatened vertebrates that are likely to use these habitats include Little Pied Bat (*Chalinolobus picatus*), Square-tailed Kite (*Lophoictinia isura*), Golden-tailed Gecko (*Strophurus taenicauda*) and Painted Honeyeater

2. Brigalow communities (REs 11.3.1, REs 11.4.3) and Brigalow/Eucalypt associations (RE11.3.7) have been cleared to the margins of adjacent vegetation types and generally exist as small unviable remnants, slivers along the margins of riparian forest types, or as secondary forests with limited structural complexity or floristic diversity. The vulnerable grass *Homopholis belsonii* has potential to occur in these remnants. Native ground covers, although naturally sparse in these communities are often displaced by exotic species including Prickly Pear (*Opuntia stricta*), Mother of Millions (*Bryophyllum delagoense*) and Harrisia Cactus (*Harrisia martinii.*) (see **Photograph A2, Appendix J**).

3. Small, isolated patches less than 10ha in extent of Brigalow (*Acacia harpophylla*) and/or Belah (*Casuarina cristata*) have reduced vertebrate values. By contrast, the very few larger patches which may support resident populations or those within close proximity (less than approximately 500m) to remnant vegetation, may have high vertebrate habitat values. A variety of species may occur in these locations including *Cyclorana verrucosa*, Golden-tailed Gecko, Dunmall's Snake, Grey Snake (*Hemiaspis daemeli*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Painted Honeyeater and Little Pied Bat. Notable examples are found in the Stratheden IPF and MA2 to the immediate west of Lake Broadwater where Glossy Black-Cockatoos were recorded.

4. The sandy rises which are scattered across flood plain areas have often retained native vegetation cover. The typifying ecosystem (RE11.3.14) has however generally been heavily impacted by ring-barking of mature canopy trees and former structural and floristic diversity has been replaced by near monotypic stands of *Callitris glaucophylla*. The habitat values for these structurally and floristically simplified

communities are limited, although Koala's (*Phascolarctos cinereus*) were regularly recorded where regrowth *Eucalyptus tereticornis* and *E. populnea* were scattered amongst *Callitris*. A rare intact stand of RE11.3.14 was identified within the Stratheden IPF footprint area **(See Photograph A3, Appendix J)** and contained numerous old large hollow-bearing trees and a robust groundcover dominated of *Lomandra longifolia*. Glossy Black-Cockatoos (Vulnerable NCA) were observed adjacent to this vegetation and may utilise selected hollows for nesting.

5. The condition of riparian vegetation varies across the project area. Vegetation associated with the Condamine River is generally in poor condition with a high proportion of dead or senescing canopy trees. The best preserved examples of riparian vegetation are associated with Wilkie Creek on the western fringes of MA2 (along the western boundary of the well area within PL252) and along Back Creek. The vegetation in these locations has retained a large proportion of mature canopy trees and native grassy ground cover. The riparian vegetation along Wilkie Creek is often up to 400m wide (see **Photograph A4, Appendix J**).

   Riparian vegetation provides unique and important habitat, particular along Wilkie Creek. Abundant hollows provide nesting and roosting opportunities for arboreal mammals and birds and the intact understorey provides habitat for species such as Rufous Bettong (*Aepyprymnus rufescens*). Koalas were regularly recorded along waterways in association with *E. tereticornis*, one of their primary food trees. A number of EVR species are likely including *C. verrucosa*, Dunmall's Snake, Grey Snake, Black-necked Stork (*Ephippiorhynchus asiaticus*) (in association with pooling water), Square-tailed Kite, Glossy Black-Cockatoo and Little Pied Bat.

5.2.4 Flora Values Identified

A total of 257 vascular flora species were recorded during the field survey including two ferns, two gymnosperms and 253 flowering plants (**Appendix K**). The list should be considered as preliminary as graminoids and forbs are under represented due to the timing of the survey (late October).

Flora of National Significance: Literature reviews identified the potential for 12 nationally significant flora species to occur in the project area and vicinity. A field survey effort incorporating 30 secondary and 2 tertiary level sites and 54 quaternary sites together with walking traverses did not locate any EPBC listed species. Based on an analysis of distribution and habitat preference, eight nationally significant species are considered to have potential to occur within the project area. A summary of habitats for EVR species discussed in relation to Management Units is provided in **Table 8** and are described below.

***Acacia chinchillensis* - Chinchilla Wattle (Vulnerable)**

Chinchilla Wattle is a spreading shrub to 2m with bluish green villous bipinnate leaves. It was identified as having potential to occur within the project area through the EPBC protected matters search tool (**Appendix B**), and Queensland Herbarium records from vouchered specimens in the search area (see **Appendix D**). It is restricted to southeast Queensland over a 150km range from near Cecil Plains to just north of Chinchilla and is known from State Forests 302 and 155 (DNR 2000). Targeted searches in suitable habitat failed to locate this species during field assessments in late October 2009. However, a record (Herbrecs) located within the Duntroon area indicate that the species has the potential to occur on flat to gently undulating plains within *Eucalyptus crebra, Callitris glaucophylla, Allocasuarina luehmannii* woodland to open forest or *Callitris glaucophylla, Allocasuarina luehmannii* open forest. These habitats are considered consistent with RE's 11.3.18, 11.5.1, 11.5.20, and non-remnant vegetation. An analysis of the species distribution and field work suggests that although potential for occurrence exists in MA1, Theten, Duntroon, Lynwood North and MA4, the species is likely to be scattered and in low densities.

Bothriochloa biloba* - Lobed Blue Grass *(Vulnerable)

Lobed Blue Grass is an erect or decumbent grass to 1m high identified as having potential to occur within the project area (MA3) through the DERM Wildnet Search and Queensland Herbarium records from vouchered specimens in the search area (see **Appendix D**). Targeted searches failed to locate this species during field assessments in late October 2009, although dry climatic conditions were unfavourable for the detection of this species at the time of survey. Existing HerbRecs records (DERM 2009) in the Cecil Plains area strongly suggest the potential for occurrences on any alluvial habitats within the project area occurring along the Condamine River floodplain. Potential habitat includes remnant and non-remnant eucalypt forests, relict and derived grasslands, with a preference for heavier-textured alluvial brown or black clay soils. In the Cecil Plains area its occurrence is associated with disturbed roadside habitat along the Condamine River Flood Plain; in River Red Gum (*Eucalyptus camaldulensis*) woodlands on sandy alluvium over clay; in *Dichanthium sericeum* grassland on heavy soil alluvium; and in a rail reserve on heavy alluvium soils.

***Dichanthium queenslandicum* – King Blue Grass (Vulnerable)**

King Blue Grass could occur within remnant and non-remnant derived grasslands on alluvial cracking clays. While Fensham (1999) and Hill (2000 in Silcock *et al.* 2007) considers that the taxon is restricted to the Central Highlands and extinct from southern Queensland and Darling Downs, it has been more recently recorded near Jondaryan (Silcock *et al.* 2007). The Jondaryan area is approximately 20 km east of the project area. A low precision record from a 1952 collection is known from the Jimbour Plain (DERM 2009) which lies approximately 35 km north of the Project Area. Silcock *et al.* (2007) consider that it may always have been near its southern ecological limit on the Darling Downs and in the Maranoa, and it is considered very rare on the Darling Downs (TSSC 2008). Suitable habitat in the form of non-remnant derived grasslands on alluvial cracking clays are present in the Project area however the floristic composition and condition of the habitat requires detailed survey to determine if King Blue Grass persists. The potential for occurrence is therefore a precautionary measure until further assessment can be carried out.

***Digitaria porrecta* - Finger Panic Grass (Vulnerable)**

Finger Panic Grass is a tufted perennial grass identified as having potential to occur within the project area through the EPBC protected matters search tool (**Appendix B**), and Queensland Herbarium records from vouchered specimens in the vicinity (see **Appendix D**). Targeted searches failed to locate this species during field assessments in late October 2009, although seasonally dry conditions were unfavourable for the detection of this species at the time of survey. However, the records located in close proximity to the project area (MA3) indicate that that the species has the potential to occur on dark cracking alluvial clay soils in tussock grasslands, derived grasslands, *Eucalyptus populnea* open forest and woodland, and fringing riverine woodlands dominated by *Eucalyptus tereticornis*. The species has the potential to occur in remnant and non-remnant habitats with records within road reserves and rail reserves.

***Homopholis belsonii* (Vulnerable)**

Homopholis belsonii is a perennial grass identified as having potential to occur within the project area through the EPBC protected matters search tool, and Queensland Herbarium records from vouchered specimens in the vicinity. A record located in proximity to the project area (4km east of Dalby, and 1.4km north of substation on dirt road flat), in *Casuarina cristata* and *Acacia melvillei* vegetation indicate that that the species has the potential to occur on brigalow and belah habitats on dark cracking clay alluvial soils. This is supported by additional records in the Miles district where the species has been recorded from remnant or partly cleared brigalow (*Acacia harpophylla*) and associated belah (*Casuarina cristata*) forest on dark brown clays and on alluvial clays derived from basalt. The species has also been recorded from fine-grained sedimentary derived soils in *Eucalyptus populnea, E. melanophloia, Acacia harpophylla* woodland consistent with RE 11.9.10.

Targeted searches failed to locate this species during field assessments in late October 2009, although dry climatic conditions were unfavourable for the detection of this species at the time of survey. Nonetheless, the species is considered to have a high potential to occur in remnant and non-remnant brigalow and belah habitats.

***Philotheca sporadica* (Vulnerable)**

Philotheca sporadica is a perennial low shrub identified as having the potential to occur within the project area through the EPBC protected matters search tool, Queensland Herbarium records from vouchered specimens in the vicinity, and a defined area search of the DERM Wildnet Database. Review of Herbarium records indicate a number of occurrences in the Kogan and Braemar areas with habitats associated with rocky weathered lateritic sandstone plateaux, ridges, and rises, and gravelly soils over sandstone. Herbrecs records are located adjacent to the western productionwell area in MA1, with several records located within the broader PL194 area. Field assessment of areas adjacent to the well area confirmed significant populations of the species associated with RE11.7.4 and 11.10.1d it is likely that this population extends into areas intended for well development and the species may be associated with both remnant and non-remnant vegetation. These occurrences suggest a potential for the species to occur in *Eucalyptus and Callitris* woodlands on Land Zones 7 and 10 where characteristic species include *Eucalyptus crebra, E. fibrosa* subsp. *nubila, E. exserta,* and *Corymbia trachyphloia* with *Callitris glaucophylla, Allocasuarina luehmannii, Acacia conferta, Acacia leiocalyx* and *Geijera parvifolia* characteristic of the shrub layer. Field access restrictions to the well area due to bio-security issues associated with a piggery on the property prevented confirmation. All remnant vegetation currently represented in certified RE mapping (DERM Version 6.0, 2009) within the western well area in MA1 is listed as essential habitat for the species and disturbance will require that compensatory measures be developed. The spatial distribution of essential habitat is provided in **Appendix L.**

***Thesium australe* - Australian Toad Flax (Vulnerable)**

Austral Toadflax is a small, straggling herb to 40 cm tall. It has the potential to occur within the project area through the EPBC protected matters search tool, Queensland Herbarium records from vouchered specimens in the vicinity, and a defined area search of the DERM Wildnet Database. The nearest record to the project area is located 4km west of Dalby on the Yaralla Road in roadside grassland on heavy alluvial soils. A more distant record is located 26km NW of Dalby in roadside *Eucalyptus populnea* grassy woodland on heavy alluvium soils. It is otherwise associated with basalt landscapes where it is known to occur in grassland. These occurrences suggest a potential for the species to occur in grassland and derived grasslands on Land Zones 3 and 4 and in *Eucalyptus populnea* woodlands RE11.3.2. Potential for occurrence of the species exists within MA3.

***Picris evae* – Hawkweed (Vulnerable)**

Hawkweed is an erect annual herb growing 1.3–1.7 m high. It is known to inhabit dark grey or red-brown soils, reddish clay-loams or medium clay soils with characteristic vegetation including *Eucalyptus* open woodlands with a grassy groundcover of typically *Dichanthium* spp (Threatened Species Scientific Committee 2008sq). It has the potential to occur within the project area through the EPBC protected matters search tool, Queensland Herbarium records from vouchered specimens in the vicinity, and a defined area search of the DERM Wildnet Database. Records are also known from non remnant grassland and woodlands on roadsides and cultivated paddocks (DECC 2005a). The nearest record is located approximately 30km southeast of the project area in *Dichanthium sericeum* grassland adjacent to a cultivated paddock on black clay soil (DERM 2009). Targeted searches failed to locate this species during field assessments in late October 2009 although dry climatic conditions were unfavourable for the detection of this species at the time of survey. No records are known from the MA's, and therefore the species is considered to have a low potential to occur non-remnant derived grasslands of roadsides and paddocks and in *Eucalyptus tereticornis* and *E. populnea* woodlands.

Flora of State Significance: Literature review identified the potential for 18 state significant EVR taxa to occur in the project area and vicinity. The baseline survey verified the occurrence of two species, *Aponogeton queenslandicus,* and *Eleocharis blakeana* as the only EVR species known to occur in the project area. A summary of habitats for EVR species discussed in relation to Management Units is provided in **Table 7** and are described below.

Aponogeton queenslandicus* – Queensland Lace Plant *(Rare NCA)

A perennial, tuberous-rooted aquatic plant, with submerged and floating leaves (NSW Scientific Committee 2000) which inhabits freshwater ephemeral habitats in drier regions, particularly gilgais in Brigalow, ponds and roadside ditches (Department of Environment and Conservation (NSW) 2009). It has the potential to occur within the project area through the Queensland Herbarium records from vouchered specimens in the vicinity, and a defined area search of the DERM Wildnet Database. It is known to occur in temporary fresh waters 30 - 60 cm, in sunny positions on clay bottoms and is absent from permanent or deeper waters (Department of Environment and Conservation (NSW) 2009). HerbRecs records (DERM 2009) for the project area indicate occurrences in gilgais in uncleared brigalow on margins of cultivated paddocks; in cleared brigalow scrub on heavy grey clay; and in large more or less permanent billabongs. A single HerbRecs record is located on the margin of the project area approximately 20 km west of Chinchilla in the Goombi area (DERM 2009). A population of Aponogeton was recorded during the field survey at Site AQ10 in a permanent freshwater lagoon (RE11.3.25g) within the Theten area. The location of this record is shown in **Figure 9a**. It is therefore considered highly likely to occur in similar wetland habitats associated with overflow channels and alluvial depressions along the Condamine River and major tributaries. The relative dryness of brigalow and/or belah communities, and non remnant brigalow/belah regrowth or pasture land on heavily gilgaied alluvial soils suggests that the species is unlikely to occur in these habitats despite being known to occur in similar habitats elsewhere in its range.

***Eleocharis blakeana* – Blake's Spikerush (Rare NCA)**

A perennial spikerush with a general height range of 30-40cm identified as having potential to occur within the project area through Queensland Herbarium records from vouchered specimens in the vicinity, and a defined area search of the DERM Wildnet Database. HerbRecs records indicate habitat in swampy alluvial situations including melonhole paddocks and artificial dam margins. Records from Lake Broadwater Conservation Park indicate high likelihood of occurrence in palustrine wetlands in woodlands of *Eucalyptus camaldulensis* and/or *E. tereticornis*. Collections of an Eleocharis species tentatively assigned to *E. blakeana* were made at Long Swamp (Site AT71, AQ73, AQ74 within MA2) within RE 11.3.27d and the identification is awaiting confirmation from the Qld Herbarium.

Potential for Significant Flora: Seven species listed on the NCA have the potential to occur in the project area. Six of these species (*Acacia chinchillensis, Digitaria porrecta, Homopholis belsonii, Philotheca sporadica, Picris evae,* and *Thesium australe*) are also listed on the EPBC Act and are discussed under nationally significant species above. The remaining three taxa are briefly discussed below. A summary of habitats for EVR species discussed in relation to Management Units is provided in **Table 7** and are described below.

***Fimbristylis vagans* (Rare NCA)**

A perennial sedge identified as having potential to occur within the project area through Queensland Herbarium records, and a defined area search of the DERM Wildnet Database. A known population within Lake Broadwater Conservation Park suggest likely occurrences in alluvial depressions, associated waterholes and of floodplain wetland areas. The species was not located during the field survey however the potential for occurrence is considered high.

***Solanum papaverifolium* (Endangered NCA)**

A prostrate or sprawling, herbaceacous resprouter 0.2-0.4 m high occurring on heavy clay soils in grassland and open woodlands in Queensland between Jimbour and Warwick (Bean 2004). Records in the Dalby district indicate it has the potential to occurr in derived and remnant grassland and woodlands and in disturbed cultivation margins on heavy alluvial clay floodplains. The species was not located during the field survey.

***Solanum stenopterum* (Vulnerable NCA)**

A sprawling or erect herbaceous resprouter 0.2-0.4m high identified as having potential to occur within the project area through Queensland Herbarium records, and a defined area search of the DERM Wildnet Database. This species is known to inhabit grassland and *Casuarina cristata* forest or *Eucalyptus populnea* woodlands on clay soils (Bean 2004). Queensland Herbarium records in Dalby and Cecil Plains district occur on loamy alluvial river banks, black soil clay plains and basalt in remnant woodland and non remnant grassland on road verges and paddocks. The species was not located during the field survey.

Table 8. Summary of potentially occurring EVR Flora species

Species	EPBC	NCA	RE	Description	Management Area
Aponogeton queenslandicus	Not Listed	R	11.3.27d	Palustrine wetland (e.g. vegetated swamp). *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2
			11.3.25/ 11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
Acacia chinchillensis	V	V	11.3.18	*Eucalyptus populnea, Callitris glaucophylla, Allocasuarina luehmannii* shrubby woodland on alluvium	Lynwood North, Duntroon
			11.5.1	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces.	Tipton South, Theten, Duntroon, MA1, MA4
			11.5.20	*Eucalyptus moluccana* and/or *E. microcarpa/ E. pilligaensis* ± *E. crebra* woodland on Cainozoic sand plains.	MA2
			Non-remnant	Regrowth areas of Land Zone 5	MA4 , Duntroon , Lynwood North
Bothriochloa biloba	V	Not Listed	11.3.25/ 11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
			11.3.27d	Palustrine wetland (e.g. vegetated swamp). *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2
			Non-remnant	Derived grasslands on alluvium.	MA3
Dichanthium	V	V	11.3.2	*Eucalyptus populnea*	Lynwood North, MA2,

Species	EPBC	NCA	RE	Description	Management Area
queenslandicum				woodland on alluvial plains.	MA4
			Non-remnant	Derived grasslands on alluvium/cracking clays	MA3
Digitaria porrecta	E	R	11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Tipton South, MA2 , MA4
			11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains.	Stratheden, MA2 , MA3
			11.3.25/11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
			11.3.27d	Palustrine wetland (e.g. vegetated swamp). *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2
			Non-remnant	Derived grasslands.	MA3
Eleocharis blakeana	Not Listed	R	11.3.25/ 11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
			11.3.27d	Palustrine wetland (e.g. vegetated swamp). *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2
Fimbristylis vagans	Not Listed	R	11.3.25/ 11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3
			11.3.27d	Palustrine wetland (e.g. vegetated swamp). *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.	MA2
Homopholis belsonii			11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Stratheden, Lynwood North, MA2
			11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.	MA2
			Non-remnant	Brigalow or belah.	MA2
Philotheca sporadica	V	V	11.5.1	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces.	Lynwood North, Duntroon, MA4
			11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius* on Cainozoic	Lynwood North, Duntroon, MA4

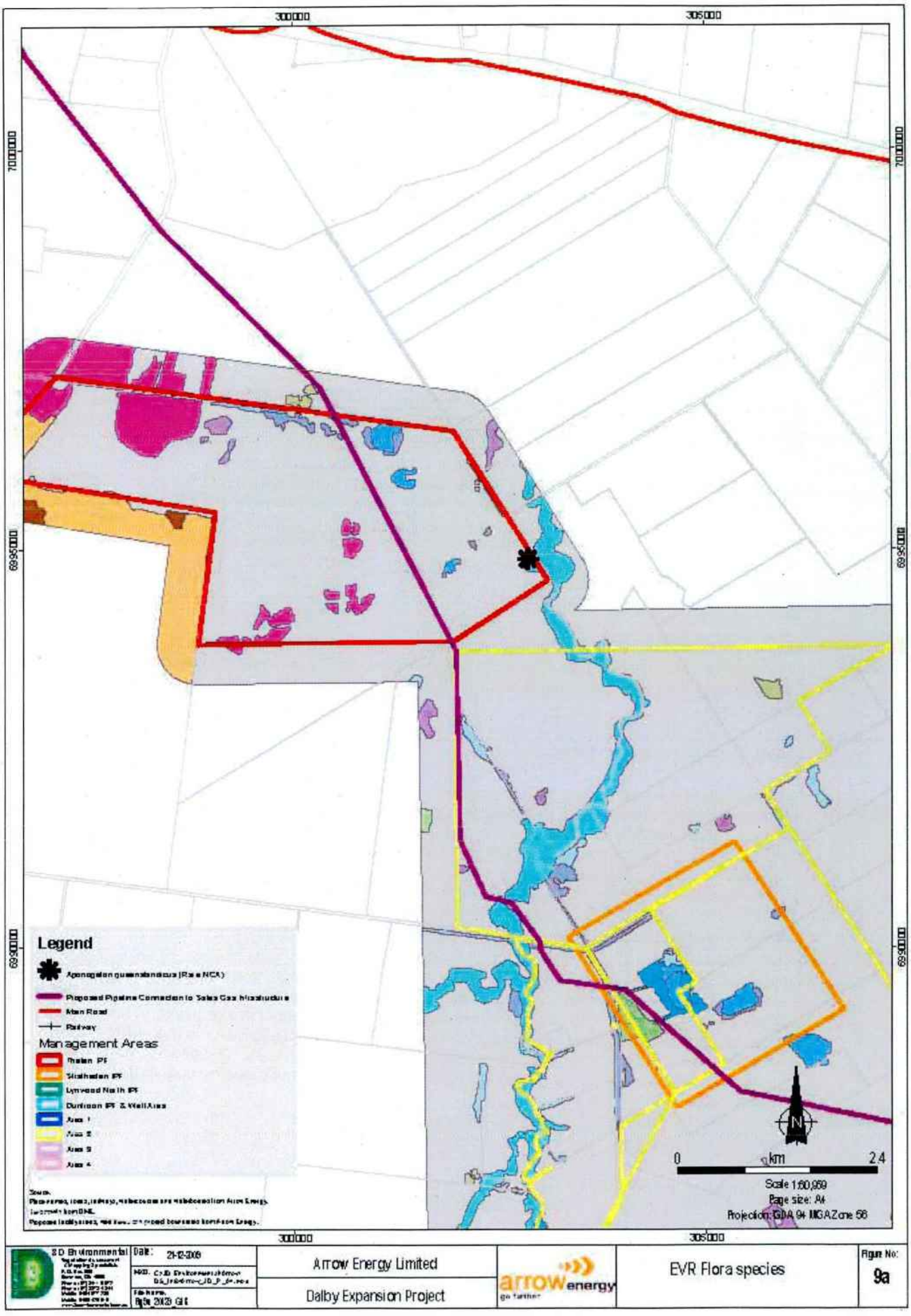
Species	EPBC	NCA	RE	Description	Management Area
				lateritic duricrust.	
			11.10.1d	*Eucalyptus crebra* woodland.	Theten, MA1
Thesium australe	V	V	11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Lynwood North, MA2 , MA4
			Non-remnant	Derived grasslands.	MA3
Picris evae	V	V	11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Tipton South, MA2 , MA4
			Non-remnant	Derived grasslands.	MA3
Solanum papaverifolium	Not listed	E	Non-remnant	Derived grasslands.	MA3
			11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Tipton South, MA2 , MA4
Solanum stenopterum	Not listed	V	Non-remnant	Derived grasslands (and roadsides).	MA3
			11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Tipton South, MA2 , MA4
			11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Stratheden, Lynwood North, MA2
			11.3.25/ 11.3.25g	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Theten, MA1, MA2 , MA3

5.2.5 Fauna Values Identified

A total of 132 vertebrate species were observed during the survey including one frog, 17 reptiles, 103 birds and 11 mammals. A list of species recorded during the survey is provided in **Appendix M**. These records represent a snap-shot of vertebrate communities present within the area. Several groups are likely to be under represented due to either the lack of suitable environmental conditions (e.g. frogs require rainfall resulting in pooling water), or the absence of suitable trapping methods (e.g. bats).

Most species identified within the survey are common under legislation. The southern Brigalow Belt BAMM lists non-EVR species that are of concern. Several BAMM species were noted during the survey including *Emydura macquarii*, Yellow-spotted Monitor (*Varanus panoptes*), Shingleback (*Trachydosaurus rugosa*), Speckled Warbler (*Chthonicola sagittata*), Grey-crowned Babbler (*Pomatostomus temporalis*), Koala, Greater Glider (*Petauroides volans*), Common Brushtail Possum (*Trichosurus vulpecula*) and Rufous Bettong. Other BAMM species such as Salmon-striped Frog (*Limnodynastes salmoni*), Pale-headed Snake (*Hoplocephalus bitorquatus*) and Black-striped Wallaby (*Macropus dorsalis*) have been previously recorded within the project area by Osmotic Ecology in other systematic surveys. Speckled Warblers, Grey-crowned Babblers and Koala's can be frequently recorded in suitable habitat. Records of BAMM species centred around Lake Broadwater Conservation Reserve and along Wilkie Creek in MA1.

A total of twenty EVR species have been recorded within the project area or surrounds, however only one species was recorded during the current survey. The lack of records within the current survey is likely to reflect bias in survey methodology or the absence of certain weather conditions for some species. All records of EVR species within the project area post 1980 are indicated in **Appendix M** (excluding WildNet records which lack GPS data). Some species are likely to occur more widely than indicated and a brief discussion of the potential occurrence of each EVR species is provided below.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Aponogeton queenslandicus (Rare NCA)
Proposed Pipeline Connection to Talinga Gas Infrastructure
Main Road
Railway
Management Areas
Thalan EPL
Strathaden EPL
Lynwood North EPL
Dunloon EPL & Well Area
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Glossy Black-Cockatoo *(Calyptorhynchus lathami)*

The Glossy Black-Cockatoo (Vulnerable, NCA) was the only EVR species recorded during the current survey. Five birds were located feeding within a stand of *A. cristata* near the Stratheden IPF option. A second record was noted west of Lake Broadwater within MA2 (See Figure 9b). Feeding evidence suggests that this area is regularly utilised by the species and the close proximity of large hollow-bearing trees provide nesting opportunities. These factors suggest that this patch of vegetation may be of local importance to the population and its preservation should be a priority.

Glossy Black-Cockatoos are well known in the local area and have been recorded from Lake Broadwater. Habitat that is likely to be of particular importance coincides with REs that contain *Casuarina cristata* such as 11.3.1, 11.3.14, 11.4.3 and 11.9.5. These habitats have become increasingly uncommon within the area and those remaining may play an important role in maintaining current populations.

Cotton Pygmy-goose (*Nettapus coromandelianus*), Freckled Duck (*Stictonetta naevosa*), Australian Painted Snipe (*Rostratula australis*) and Black-necked Stork (*Ephippiorhynchus asiaticus*)

Aquatic habitats are uncommon within the project area, restricted to Lake Broadwater, Long Swamp, Wilkie Creek and the Condamine River. Cotton Pygmy-geese and Freckled Ducks (*Stictonetta naevosa*) occur in larger water bodies and are therefore considered likely to be restricted to Lake Broadwater, an assumption supported by database records. By contrast, the Black-necked Stork has broader habitat requirements. While it is likely to be most common at Lake Broadwater, it might also occur at Long Creek or in larger pools along Wilkie Creek and the Condamine River (RE 11.3.25g). Finally, the Painted Snipe (*Rostratula australis*) has very specific

habitat requirements, preferring habitats that include open areas interspersed with clumping vegetation or small islands. Such habitats are uncommon and only likely at Lake Broadwater and possibly Long Swamp. All previous records of this species have been restricted to Lake Broadwater.

Rough Frog *(Cyclorana verrucosa)*

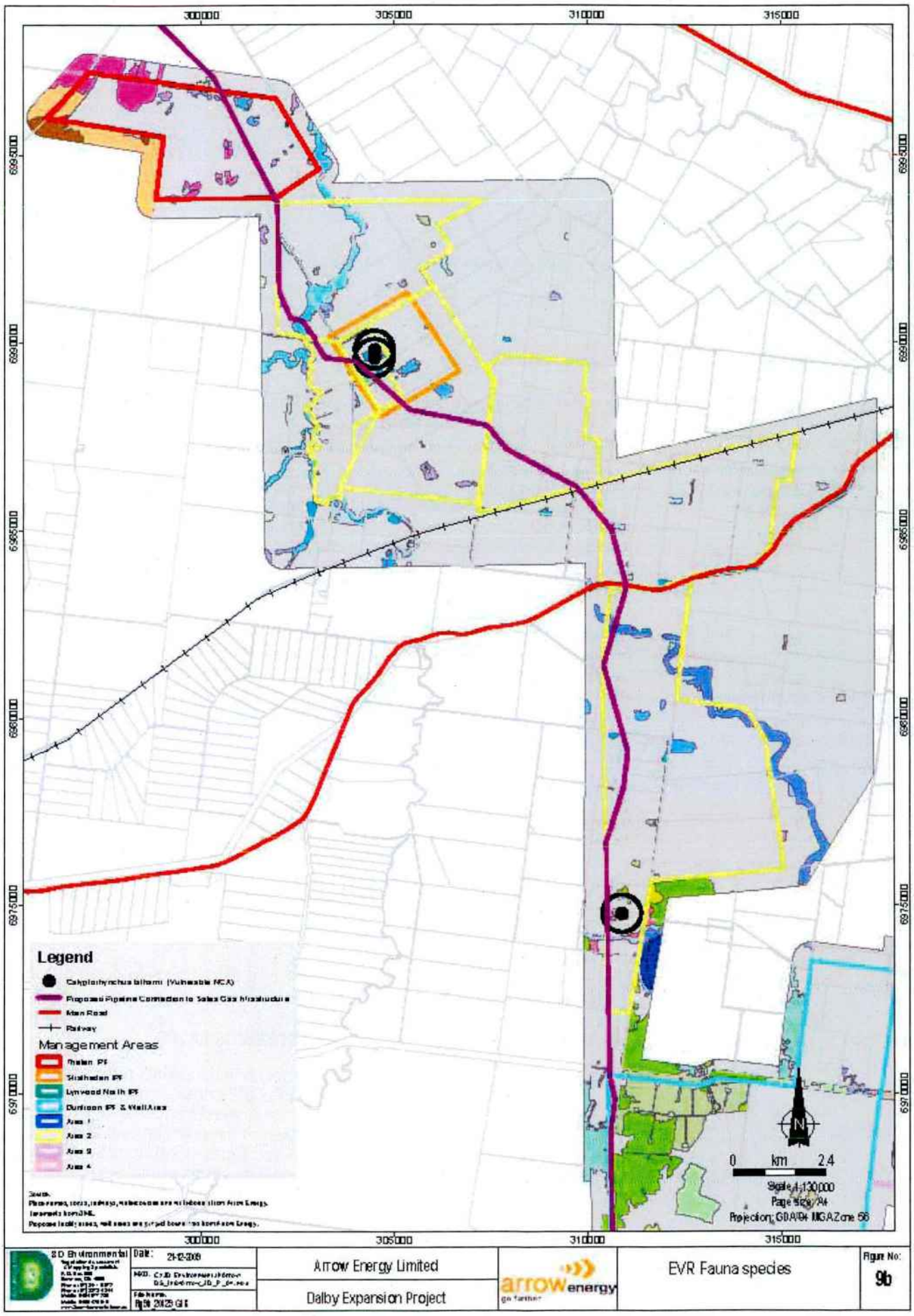
Cyclorana verrucosa is a common frog species, despite its Rare listing under the NCA. It has been regularly recorded around Lake Broadwater and within the local area. Optimal habitats coincide with ephemeral pools, formed after heavy rain on claypans. However, it may also be located in more loamy or sandy habitats. Remnant vegetation is not a pre-requisite for the species and it is often located breeding along roadside ditches or in open un-tilled paddocks. It is therefore likely to be broadly distributed throughout the project area, particularly within Land Zones 3 and 4.

Golden-tailed Geckos (*Strophurus taenicauda*)

Golden-tailed Geckos have a patchy occurrence, being quite abundant in some locations and absent from seemingly similar locations. They are typically encountered in habitats on poorer soils where *Callitris* (Cypress Pine) is present, although this is not a habitat pre-requisite. The species has been recorded from Lake Broadwater and within close proximity to MA1 in the north. When abundant, they are often easy to locate resting beneath exfoliating bark. Despite substantial effort to locate this species during the current survey, the species was not detected suggesting that they are uncommon within the area.

Grey Snake (*Hemiaspis signata*)

Grey Snakes feed predominantly on frog species (Shine 1998) and is therefore most likely in low-lying areas (Land Zones 3 and 4). However as frogs may occur in most habitats, their occurrence should not be restricted to riparian or floodplains. They may also occur in sandy rises (e.g. Land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Calyptorhynchus lathami (Vulnerable MCA)
Proposed Pipeline Connection to Santos Gas Infrastructure
Main Road
Railway
Management Areas
Area 1
Area 2
Area 3
Area 4
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Projection: GDA/94 MGA Zone 56
SD Environmental
Date: 21-12-2009
Arrow Energy Limited
Dalby Expansion Project
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EVR Fauna species
Figure No:
9b

Zones 5 and 9), but are not expected to occur in rocky outcrops (i.e. Land Zone 7). They can be enigmatic, occurring in both remnant habitats and non-remnant grazing land, although they are much less common in non-remnant areas. Within the project area, most land modification is associated with tilled soils and the species is therefore likely to be restricted to remnant habitats and linear corridors.

Dunmall's Snake (*Furina dunmalli*)

The Dumnall's Snake is rarely encountered and highly enigmatic. Historic records are known from Lake Broadwater, however the species has not been recorded from this location for some time. While they can occur in unusual locations, most records occur in remnant vegetation including Brigalow, open woodland and even tall forests. They may occur in any woodland or forests vegetation types within the project area, but are probably absent from disturbed vegetation (e.g. western portion of the Lynwood North IPF).

Five-clawed worm skink *(Anomalopus mackayi)*

This small, near limbless lizard, is a native grassland specialist and likely to be restricted to areas of native grasslands occurring on cracking dark clays (Wilson 2005). Suitable habitats will include derived grasslands (vegetation community Der_grass) which are considered to provide habitat values consistent with the remnant grasslands (RE11.3.21) which occur in the broader region. While non-remnant, these areas may be important due to widespread loss of natural grasslands within the local area. Most derived grasslands were located within MA3

Regent Honeyeater (*Anthochaera Phrygia*), Black-chinned Honeyeater (*Melithreptus gularis*)

Regent Honeyeaters and Black-chinned Honeyeaters favour habitats that are dominated by flowering eucalypts, particularly vegetation with box (e.g. *E. melliodora*) and ironbarks (*E. sideroxylon*). Habitat for these species within the project area is limited. They are also known to sporadically use *E. tereticornis* during peak flowering periods. Within the project area individuals are most likely to occur along watercourses where suitable Eucalypts are present (i.e. RE 11.3.2, 11.3.4, 11.3.14, 11.3.18 and 11.3.25).

Painted Honeyeater *(Grantiella picta)*

The Painted Honeyeater is a mistletoe specialist (Higgins *et. al.* 2001, Oliver *et. al.* 2003, B MA2 008). Its occurrence within the EA area will closely follow mistletoe abundance. Concentrations of mistletoe may occur in any vegetation, but seem to be particularly frequent in Acacias and Eucalypts along roadways and linear fragments (including regrowth communities) (Norton and Smith 1999, Bowen *et. al.* 2009). Two areas of high mistletoe abundance were noted during the current survey:

1) Brigalow and *C. cristata* vegetation (RE 11.4.3) to the west of Lake Broadwater (AS69); shown within MA2 (shown in **Figure 7a**); and
2) within roadside regrowth (RE-pop) along Ducklo-School Rd to the immediate north of the Strathedon IPF shown in **Figure 7a**.

Square-tailed Kite (*Lophoictinia isura*), Little Pied Bat *(Chalinolobus picatus)*

Both the Square-tailed Kite and Little Pied Bat occur in a wide variety of habitats including areas of advanced regrowth. They are therefore, possible within any patches of remnant forest vegetation, but are unlikely in grasslands or tilled crops. The Square-tailed Kite is most frequently associated with larger contiguous vegetation patches and is therefore more likely in the north around MA 1 and along the western boundaries of MA2, Duntroon, MA4 and Lynwood North Both species can be regularly located along riparian corridors and are have a high chance of occurring along Wilkie Creek and the Condamine River.

Turquoise Parrot *(Neophema pulchella)*

Turquoise Parrots inhabit open woodlands with a native grass understorey (Higgins 1999). However, they will not frequent locations where grasses become thick, preferring instead short open grasslands that allow them to move freely along the ground. These habitats are rare in the project area and historic records are restricted to Lake Broadwater.

Grey Goshawk *(Accipiter novaehollandiae)*, Major Mitchell's Cockatoo *(Lophochroa leadbeateri)*, Spotted-tailed Quoll *(Dasyurus maculatus)*

These species are very uncommon within the local area and represented by one or two records within databases. In the majority of cases, these are likely to represent transient or dispersing individuals and resident populations are improbable. No habitats are therefore likely to be of importance for these species.

5.2.6 Exotic Species

Declared Pest Plants: Four weeds declared under the Land Protection (Pest and Stock Route Management) Act 2002 were observed the project area (**Table 9**).

- *Opuntia stricta* (Prickly Pear)
- *Opuntia tomentosa* (Velvet Pear)
- *Harrisia martini* (Harrisia cactus)
- *Bryophyllum delagoensis* (Mother of Millions). Under the LPA Act, landowners must take reasonable steps to keep their land free of Class 2 pests.

Table 9. Summary of Declared Weeds Known to occur in Project Area. All species are found in non remnant vegetation.

Pest Class	Common Name	Species Name	Field Sites	RE	Comments
Class 2	Velvet Pear	*Opuntia tomentosa*	8, 12, 17, 18, 26, 48, 53, 78	11.3.4, 11.3.14, 11.3.17, 11.3.26, 11.9.5, 11.9.7	The majority of occurrences were <5%cover.
Class 2	Prickly Pear	*Opuntia stricta*	4, 24, 33, 42, 44, 48, 77, 79	11.3.1, 11.4.3, 11.5.1, 11.101d, 11.3.26	Occasional dense patches in 11.3.1 otherwise scattered occurrences at <5% cover.
Class 2	Harisia cactus	*Harrissia martini*	15, 29, 30	11.3.1, 11.3.2, 11.3.14	All occurrences were <5%cover.
Class 2	Mother of Millions	*Bryophyllum delagoensis*	28, 33, 37, 38, 44	11.3.1, 11.3.2, 11.3.17, 11.3.25,	Dense infestations of >50% groundcover recorded in 11.3.17. Infestations otherwise scattered on disturbed road margins.

Environmental Weeds: Environmental weed species may pose a threat to ecological processes and economic activities and may be encouraged by various land uses and disturbance. The most widespread environmental weed encountered was Maynes Pest (*Verbena aristigera*) which commonly occurs in the groundcover of the alluvial regional ecosystems 11.3.2, 11.3.4, 11.3.14, and 11.3.25. Riparian woodlands and open forests showed varying degrees of infestation of pasture grasses such as Rhodes Grass (*Chloris gayana*) and Giant Panic (*Megathyrus maximum* var. *maximum*) with sporadic occurrences of mimosa bush (*Acacia farnesiana*).

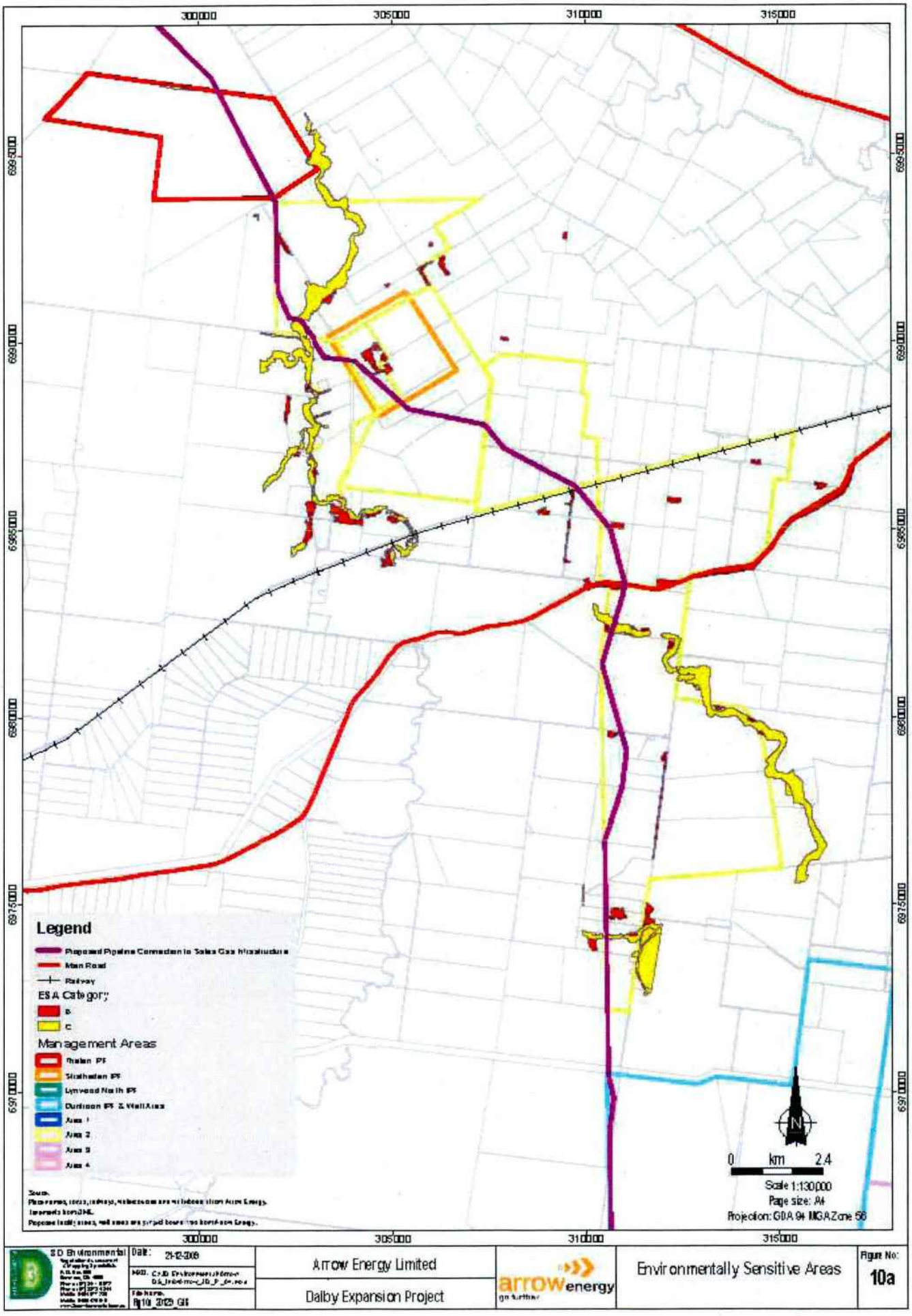
Pest Vertebrates: Fifteen exotic vertebrate species are known to occur within the project area. Many of these pests, such as Cane Toad, House Mouse, Rock Dove, Common Mynah and Starling, are abundant. Other species such as Indian Peafowl, Ostrich and Dingo are uncommon. Species that might have some impact on ecological values include the following:

- Cane Toad.
- Feral Cat (Class 2 pest, LPA).
- European Rabbit (Class 2 pest, LPA).
- Feral Pig (Class 2 pest, LPA).
- Red Fox (Class 2 pest, LPA).

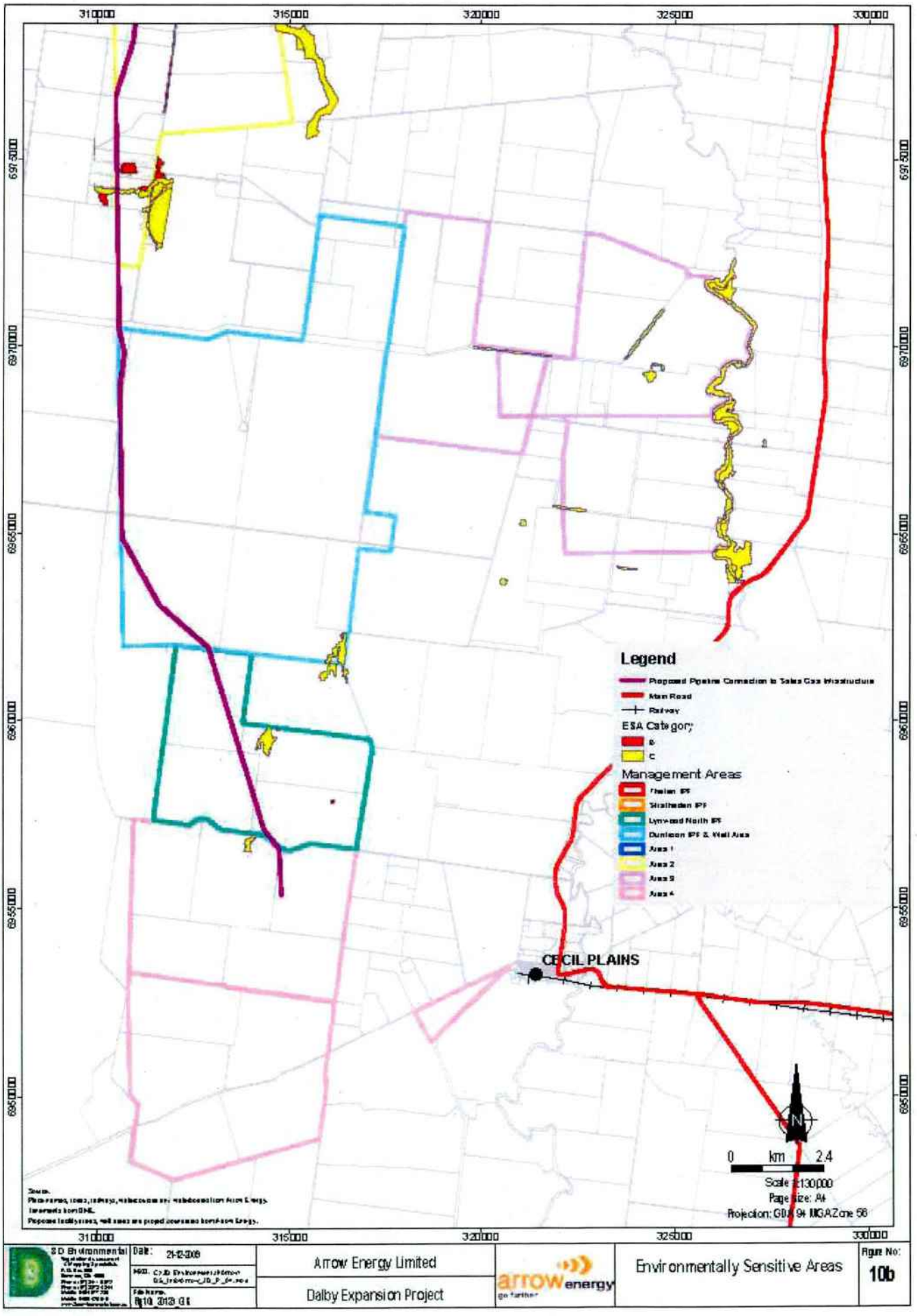
In particular, introduced predators such as Feral Cat and Red Fox may have deleterious effects on native vertebrate communities and can cause local extinctions (Biodiversity Group, 1999, DEWHA 2008).

5.2.7 Environmentally Sensitive Areas

The distribution of ESAs based on vegetation status (Biodiversity Status) have been adjusted according to the results of field survey with revised mapping in selected areas provided in **Figures 10a** and **10b**. This adjustment affects those REs with a Biodiversity Status of Endangered (Category B ESAs) and Of Concern (Category C ESAs). Category A ESAs and Category C ESAs based on catchment area and tenure remain unchanged and their location has been previously indicated in **Section 5.1.4.**



SD Environmental	Date: 21-12-2009	Arrow Energy Limited	arrowenergy	Figure No: 10a
		Dalby Expansion Project		Environmentally Sensitive Areas



SD Environmental	Date: 21-12-2009	Arrow Energy Limited	arrow energy	Figure No: 10b
		Dalby Expansion Project		Environmentally Sensitive Areas

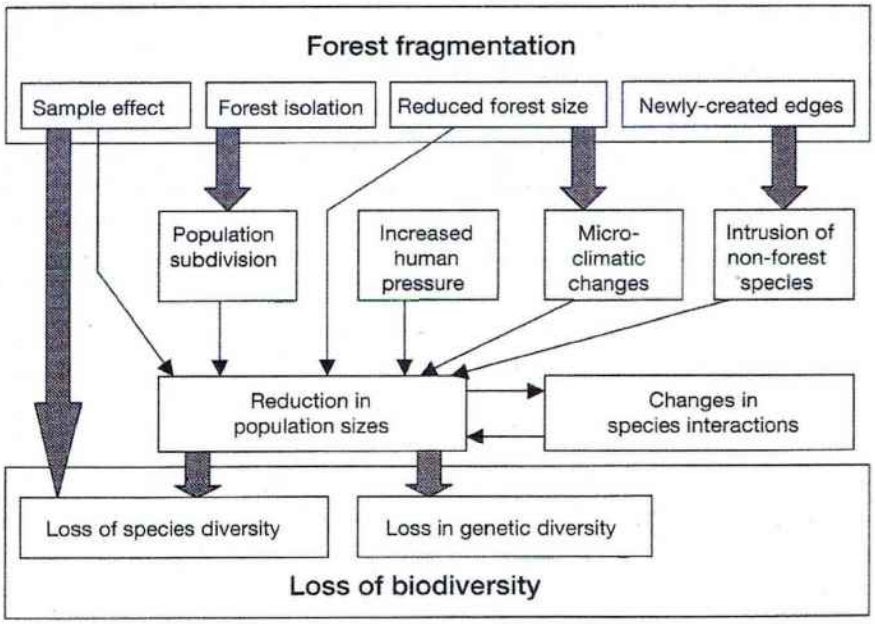
6. Potential for Environmental Impact or Enhancement

Landscape modification by humans can have a number of impacts on biological systems. Major impacts to terrestrial ecological values associated with development of the project area include:

- land clearing resulting in plant and animal mortality, loss and reduction of habitat and increased erosion or sedimentation;
- dissection and fragmentation of habitat through development of linear infrastructure including access tracks to well sites;
- edge affects associated with habitat fragmentation including potential impacts on environmentally sensitive areas;
- discharge of saline waters into vegetation and/or wetland areas;
- direct loss of 'endangered' and 'of concern' vegetation as per the VMA and vegetation communities of EPBC significance (EPBC Act 1999);
- loss of habitat important for significant flora and vertebrate species (as per applicable state and federal legislation); and
- indirect impacts on populations of conservation significant terrestrial flora and vertebrate species.

Whilst treated and considered individually, these impacts often interact (**Figure 11**). When these effects reinforce one another, they can cause a cascade of deleterious effects that can be very difficult to reverse (Lindenmayer and Fischer 2006). Each potential impact requires mitigation wherever possible to avoid reinforcement.

Figure 11. Interacting effects of landscape modification (Lindenmayer and Burgman 2005)



6.1 Land Clearing

Land clearing affects flora and fauna in several ways as listed below:

- Individuals may be killed or injured as a direct result from clearing activities.
- Vegetation clearing replaces native habitats with an altered landscape. Often these landscapes are structurally simplistic and do not provide the necessary habitat characteristics to allow existing populations to persist.
- Displaced individuals that move to nearby vegetation are often unable to compete with resident animals and also die.
- A reduction in the abundance and distribution of species due to the above effects.
- The removal of perennial vegetation contributes to erosion and declines in water quality.

Land clearing and the loss of habitat are closely associated with habitat fragmentation and edge effects. The portion of native vegetation to be cleared for the proposed gas extraction activities is not significant in the context of surrounding vegetation. Vegetation loss will be associated with the construction of the proposed Duntroon facility, however many habitats in this location have already been significantly affected by past activities. As such, they do not retain the same level of value as nearby remnant vegetation (see **Section 5.2.3**).

By contrast, habitats at the Stratheden IPF option contain a number of values including essential habitat for Koala and Glossy Black-Cockatoo. Despite the relatively minor extent of vegetation in this area, its loss may have disproportionate impacts. Vegetation loss will also result from the construction of gas wells and associated access tracks. In most cases, the portion of vegetation clearing required for these activities are minor in the context of surrounding vegetation. Fragmentation and edge effects from these activities are more likely to affect ecological values.

6.2 Habitat Fragmentation

The process of habitat fragmentation may lead to:

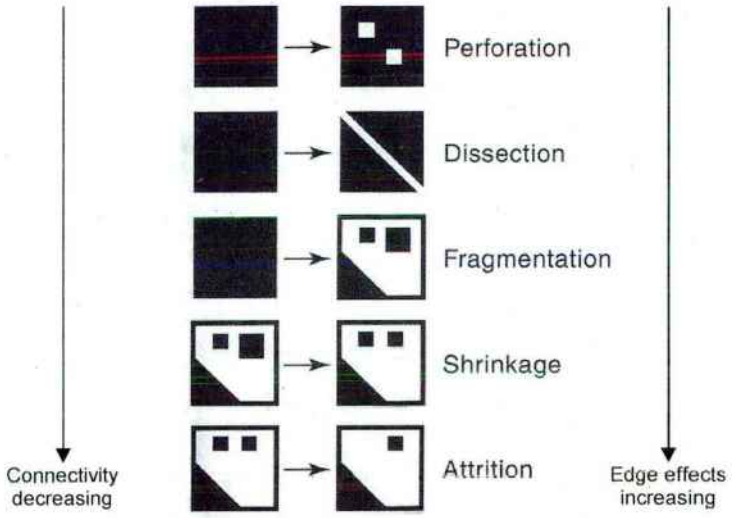
- altering landscape (and hence habitat) mosaics;
- loss of large core unmodified habitats;
- increasing movement barriers, isolating populations; and
- a reduction in the likelihood of stochastic events (e.g. fire) having broad scale impacts.

These impacts may occur concurrently and are discussed in more detail below.

Vegetation clearing results in habitat fragmentation. Forman (1995) outlined five ways in which this process may be described (**Figure 12**). Forman's theory does not account for habitat degradation that occurs due to edge effects and is therefore over simplistic. However, it does provide a useful framework for discussing the types of fragmentation that might occur due to the proposed activities. Perforation and dissection in large patches will occur whenever wells, pipelines and access tracks are constructed. However, depending on their location, these may also reduce habitats extent. For example, the construction of a pipeline and associated access tracks through the eastern section of MA1 has shrunk the habitat, albeit minor in context.

Attrition generally occurs in highly altered landscapes where scattered patches remain. Vegetation within the project area is generally clumped, or in linear stretches reducing the likelihood of attrition. However, attrition may occur if well or infrastructure locations are placed over small vegetation patches (e.g. the proposed Stratheden IPF). Attrition of habitat may not have a deleterious impact at a local scale if those habitat values are well represented nearby or those areas lost were highly degraded and unviable.

Figure 12. Human induced landscape modifications (Forman 1995)



Small patches of vegetation support less species than large intact patches and are more susceptible to extinction (MacArthur and Wilson 1963, Rosenzweig 1995). Species that are resident in smaller patches are typically a subset of communities found in nearby larger habitat patches (Patterson and Atmar 1986, Cutler 1991, Doak and Mills 1994) and the persistence of these populations is reliant on re-colonisation and immigration. Re-colonisation and immigration to small "island" habitats is dependent on:

- the presence of a nearby source population.
- the ability of individual organisms to migrate across the modified matrix.

The retention of large intact and unmodified vegetation patches is therefore a crucial conservation principle as these provide source populations for surrounding habitat patches. The creation of potential movement barriers along pipeline routes may hinder animal movement, bisecting large patches, or previously connected patches.

Often the affects of habitat isolation has a lag-time, with the full impacts not realised for many years. For example, studies have found that disrupted natal dispersal resulted in the loss of young Brown Treecreepers from isolated patches (Walters *et al.* 1999). Without young birds and with no immigration, the aging population senesces. Similarly, Eastern Yellow Robins may have sufficient resources to exist, but insufficient resources to reproduce leading to aging population (Zanette *et al.* 2000). Both processes lead to a local extinction years after the initial isolation event. Many species that have been recorded by Osmotic Ecology within the project area including Eastern Yellow Robins, Red-caped Robins, White-throated Treecreepers, Speckled Warblers, Grey-crowned Babbler, Jacky Winter, Black-striped Wallabies and Rufous Bettong, are known to be declining in southern Australian where historical clearing has been severe (Cogger *et al.* 2003, Olsen *et al.* 2005).

Artificial habitats or potential movement barriers created by pipelines and associated roadways are relatively narrow. Many vertebrate species can be observed crossing bitumen roads of similar width, suggesting that these narrow disturbance corridors should not impact movement for most vertebrates. Vagile species such as birds, larger mammals and bats will readily cross these cuttings. Impacts may however, be greater on smaller ground dwelling species such as snakes, lizards and small mammals, or arboreal species such as gliders. Mitigation measures should therefore focus on retaining ground movement (see **Section 7.1**), thereby retaining functional core habitat areas.

Clearing for pipelines and roadways may have a positive effect by reducing the chance of stochastic events sweeping through an entire patch and causing widespread biodiversity loss. For example, pipeline and roadways act as fire breaks.

Major impacts of this fragmentation are detailed below:

- Loss of vegetation vigour along disturbed margins. Loss of vigour, particularly of ground cover may be associated with increased light penetration, dust or exotic weed invasion.
- Degradation of riparian and in-stream habitats through increased sedimentation and changes to hydrological regime.
- Loss of habitat for significant flora species through habitat degradation.
- Impacts to significant wildlife corridors including the major riparian corridors fringing Wilkie Creek and the Condamine River.

6.3 Edge Effects

Edge effects refer to the changes in biological and physical conditions that occur at an ecosystem boundary and within adjacent ecosystems (Lindenmayer and Burgman 2005). While a variety of edge effects result from land modification, only a limited number are likely to have significant impacts on remaining values including:

- weed infestation and consequential alterations to habitat structure;
- modifications to community interactions (e.g. competition, increased aggression etc); and
- increased predation.

These impacts may penetrate hundreds of meters into vegetation remnants, thus significantly influencing the distribution and abundance of species that inhabit these areas (Lindenmayer and Fischer 2006).

Modification of environmental conditions and microclimatic conditions along induced edges make conditions particularly favourable for the growth of non-native plants (Lindenmayer and Fischer 2006). Furthermore, greater exposure to wind and surface flow due to the loss of canopy and shrub features, increase weed propagule movement and weed spread. Weed invasion is one of the most notable and severe edge effects. Once established, weeds may have a variety of deleterious effects. Typically aggressive in growth, weeds may out-compete, or reduce the fitness of native plant species. Furthermore, some species promote fire, increasing fire intensity and frequency causing serious long-term problems in fire sensitive vegetation. These processes, if severe, can positively reinforce the movement of weeds into otherwise unaffected areas and in worse case form monocultures.

Perhaps the most aggressive and notable weed infestations arise from exotic grass species. These are easily transported by wind or machinery and can quickly take hold. Unlike many native grass species, which occur in isolated clumps forming a mosaic with bare ground, exotic weeds can form thick, choking, monocultures. This inhibits the growth of native grasses and legumes. It also alters the ground structure, reducing value to native ground dwelling vertebrates. As a result, both flora and fauna biodiversity is reduced where exotic grasses are abundant. Australian examples of these deleterious processes have been well documented within the Brigalow Belt (Franks 2002, Butler and Fairfax 2003).

Previous soil stabilisation undertaken along gas pipelines in the Project Area have included seeding with exotic Rhodes Grass (*Chloris gayana*). While this may grow quickly and stabilise the surface, it poses a significant threat to native vegetation. There is little issue using this technique in improved pastures, but its continued use in or adjacent to native vegetation may promote serious edge effects.

Studies have shown that some species avoid edges while others are more common along edges (Fletcher 2005). Edge dominant species are often adapted to open habitats with little vertical or horizontal structure. These species are typically aggressive in nature, compounding the effects on edge sensitive species. Noisy Miners for example, are extremely abundant in simplified habitats, aggressive, and scare away most other small insectivorous birds. Their abundance along edges is often at the expense of smaller native bird species (Grey *et al.* 1997).

Another edge associated community interaction is predation. While not universal, nest predation and brood parasitism is often higher along edges than in core habitats. This is particularly apparent between strongly contrasting landscapes such as along agricultural land (Lahti 2001), probably due to both greater predator abundance and greater predation efficiency at edges (Luck *et al* 1999).

Edges and resulting habitat simplification can increase exotic predator abundance. Foxes for example, are typically absent from dense forest areas, preferring open habitats or edges of native vegetation adjacent farming land. This may be due to a corresponding increase in favoured prey such as Rabbits and Rats (Catling and Burt 1995). It has also been suggested that the creation of tracks and roads through existing vegetation may facilitate the penetration of exotic species into core habitats (Andrews 1990), although movement into dense forests may be limited (Catling and Burt 1995).

6.4 Impacts to Environmentally Sensitive Areas

Category A ESAs: Potential exists for Category A ESAs to be impacted by the project activities. The southern portion of MA2 and northern portion of the Duntroon IPF and well area drains into the catchment of Lake Broadwater, a Category A ESA and Wetland of National Significance. It is considered that unless appropriately managed (see recommendations set out in **Section 7.3**), the most significant threats that the project poses to the area's natural values are potential sediment and saline discharge into this catchment.

Category B ESAs: Category B ESAs within the project area include REs 11.4.3, 11.3.1, 11.9.5 and 11.3.17. These ecosystems are associated with fertile clay soils that are highly susceptible to both erosion and exotic species invasion. Infestations of Prickly Pear (*Opuntia stricta*), Harrisia Cactus (*Harrisia martinii*) and Mother of Millions (*Bryophyllum delagoense*) were recorded within these communities, typically invading along exposed and highly disturbed margins. Failure to follow weed hygiene protocols coupled with increased vehicular traffic may facilitate increases in the rate and extent of exotic species invasion (particularly Mother of Millions) into these communities.

Wetland Communities: Long Swamp lies within MA2 and is a well known wetland feature in the region, filling on a seasonal basis and discharging into Wilkie Creek. Representation of the feature as RE11.3.2 in Certified RE Mapping (Version 6.0, 2009) is incorrect with field survey confirming features typical of RE11.3.27d (palustrine wetland). Impacts to wetland habitat values may result from sedimentation or from saline discharge into the feature.

6.5 Potential Impacts to Floristic Values

6.5.1 Direct Impacts to Significant Vegetation Communities and Regional Ecosystems

The nature of the development means that both facility and infrastructure location is characterised by a certain degree of flexibility, allowing direct impacts to significant vegetation (including significant regional ecosystems and EPBC significant vegetation communities) to be largely avoided through a rigorous site selection process. Facility placement should utilise site options in previously cleared or disturbed vegetation wherever possible and final site layout is dependant in part on the results of this study, to identify levels of constraint around certain development options. It is expected that direct impacts to 'not of concern' regional ecosystems 11.7.4, 11.9.9, 11.10.1 and 11.5.1 will be unavoidable during development of well areas in MA1, MA4 and Duntroon.

The potential impact of the proposed PCR on RE values has been quantified in **Table 10,** based on a maximum possible buffer width of 15m (30m wide construction corridor). It is expected that these impacts will be significantly reduced through alignment tuning and narrowing of the construction corridor In the vicinity of significant vegetation. Impacts caused by the construction of wells and gathering lines is less certain due to the flexibility in infrastructure location.

Table 10. Maximum likely impacts in hectares (Ha) of the pipeline connection route on REs and significant vegetation communities based on a 30m wide construction corridor.

RE	Bio Status*	VM Status**	Maximum Impact (Ha)***
11.3.17	Endangered	Of Concern	0.2
11.3.18	NCAP	Of Concern	0.9
11.3.2	Of Concern	Of Concern	0.1
11.3.4	Of Concern	Of Concern	0.2
11.3.27d	Of Concern	Not of Concern	0.6
11.5.1	NCAP	Not of Concern	6.6
11.5.1a	NCAP	Not of Concern	2.8
11.5.20	NCAP	Not of Concern	4.5
11.7.4	NCAP	Not of Concern	8.3
11.7.5	NCAP	Not of Concern	0.5
11.7.7	NCAP	Not of Concern	2.5

* Subjective assessment of habitat sensitivity allocated by the EPA for Biodiversity Planning Purposes
** Vegetation Management Act, 1999.
*** Results based on detailed mapping provided by 3d Environmental combined with DERM mapping (Version 6.0, 2009) in areas not subject to mapping revision.

6.5.2 Impacts to Flora Species

Vegetation clearing and fragmentation of essential habitat

Disturbance to woodlands and derived non-remnant grasslands on cracking clay alluvial soils has the potential to impact on a range of EVR flora species. Essential habitat for *Philotheca sporadica* (as regulated under the VMA) is indicated within well areas associated with MA 1 (See **Appendix L**) providing an indication of the locations of known populations of the species. The potential occurrence of a number of EVR species within grassy road reserves renders them susceptible to vegetation clearing and disturbance by machinery, vehicles and weed competition. Susceptible species include *Digitaria porrecta, Bothriochloa biloba, Homopholis belsonii, Picris evae, Solanum papaverivolium, Solanum stenophorum,* and *Thesium australe.*

Changes to drainage, hydrology and water quality

Essential habitat of the aquatic plant *Aponogeton queenslandicus* (Rare-NCA) occurs within RE11.3.27d (MA2) in the form of permanent and semi permanent freshwater lagoons in alluvial depressions. Aponogeton requires a shallow freshwater habitat of 30-60cm depth (Jacobs 1993). Changes to inflow and outflow (flood size, frequency and duration) and water quality (increased salinity) have the potential to cause extinction of localised and isolated populations, that are are susceptible to catastrophic events due to the small population size and extent (NSW Scientific Committee 2000).

Populations of *Eleocharis blakeana* (Rare-NCA) and *Fimbristylis vegans* (Rare-NCA) are likely to occur in riparian woodlands (RE11.3.25/11.3.25g within Theten, MA1, MA2, MA3) and in vegetated swamps supporting *Eucalyptus camaldulensis* and/or *E. tereticornis* woodlands (11.3.27d within MA2). These species are similarly subject to potential impacts from changes to water quality (increased salinity) and interruption to overland flows.

Weed dispersal and introduction

The project has the potential to disperse existing weeds and introduce new or emerging weeds in the project area during construction and operation. In particular, infestations of Mother of Millions, a Class 2 declared weed, along disturbed roadsides and in remnant vegetation and has the potential to spread by ground disturbance such as grading, removal and relocation of topsoil. The movement of equipment, machinery and soil/gravels also has the potential to introduce weed species which are currently not found in the project area. Weeds such as Lippia *(Phyla canescens)* and White Foxtail Grass (*Pennisetum villosum)* are listed as important pests in the Condamine Alliance Resource Management Area however are currently undeclared (Purcell 2005).

6.6 Potential Impacts to Fauna Values

Section 5.1.3 outlines EVR species that are not likely to be resident within the project area despite database records. Most of these species are likely to be transient and therefore not reliant on habitats within the project area. Other species discussed in **Section 5.1.3** are restricted to Lake Broadwater (e.g. Cotton Pygmy-goose and Freckled Duck). To minimise impacts in the Lake Broadwater area, a 1000m, exclusion buffer for any new infrastructure or disturbance activities disturbance actlvities from the conservation area boundary is recommended. Land clearing, habitat fragmentation, edge effects and predation, as described in **Sections 6.1** to **6.3** above, have the potential to impact other EVR vertebrates known or recorded within the project area to varying degrees. Impacts to individual species of high relevance are discussed below.

Rough Frog *(Cyclorana verrucosa)*

Development activities will have a high potential to affect or result in a loss of habitats currently used by this species, particularly on clay soils (Landzone 4). However, the species is very abundant and widespread in the local area and the loss of individuals or habitat is unlikely to be significant. Furthermore, the species inhabits modified landscapes including grazing land and roadside ditches. This high resilience to habitat change suggests that the bulk of development activities will have little or no long-term impacts.

While some individuals may become trapped within trenches during the laying of pipes and pipelines (PCR), the loss of these animals is unlikely to significantly affect local populations. However mitigation measures to reduce this impact are relatively easy and should be considered (see **Section 7.4)**.

Golden-tailed Gecko (*Strophurus taenicauda*)

Vegetation clearing, particularly of habitats dominated by *Callitris* will increase Golden-tailed Gecko mortality, displace individuals and result in the loss of habitat. However, habitat for this species abounds and in the broader landscape these impacts are not likely to be significant.

Movement of individuals in otherwise contiguous habitat may be reduced by pipeline easements. However, the species is often recorded crossing bitumen roads of similar width and hence complete isolation is unlikely. Nevertheless, movement hindrances across these modified corridors may be alleviated by creation of refugia and cover (see **Section 7.1)**.

Finally, the species is highly susceptible to capture and resulting death in open trenches. This may increase local mortality and where isolated populations occur, reduce genetic diversity through loss of individuals. Details of recommended mitigation measures are contained in **Section 7.5**.

Five Clawed Worm Skink *(Anomalopus mackayi)*

Suitable habitat within the project area for this species is not common, predominantly restricted to derived grasslands in MA3 . Accordingly, populations may not be extensive and the loss of individuals through direct mortality from clearing, trench deaths and displacement could have a significant impact. Furthermore, any reduction of suitable habitat reduces the species population and distribution.

Native grasslands are also highly susceptible to exotic grass invasion, rendering habitat for this species unsuitable. Increased weed invasion associated with soil disturbance and edge effects resulting from development activities pose a significant threat to populations and habitats.

Little is known about the movement of this species. However, it is fossorial in habitat, moving through the upper surfaces of soil and debris. Common with other members of the genus, it is rarely encountered crossing roads. It is probable that this species avoids open exposed surfaces where predation risks are high. Consequently, disturbance corridors associated with pipeline easements have the potential to fragment existing populations.

Grey Snake and Dunmall's Snake *(Hemiaspis damelii* and *Furina dunmalli)*

While having different diets (Shine 1998) and slightly different habitat preferences, potential impacts on these two species are similar and discussed together. Both species may be impacted through direct mortality related to clearing, loss of habitat and displacement. Habitat modification resulting from weed invasion is also likely to affect these species. Both species are readily observed crossing roads, suggesting that narrow artificial landscapes do not impose an impenetrable barrier. However, it is possible that movement attempts will be reduced, the impacts of which are difficult to assess without knowing the severity of movement loss. Mitigation measures suggested in **Sections 7.1** and **Section 7.2** aim to reduce the difference between modified pipeline easements and native vegetation, thereby facilitating movement.

Gas development within the greater Surat Basin has found that these two species regularly fall into open trenches. Resulting mortality may affect smaller populations and potential avoidance / mitigation measures are detailed in **Section 7.5**.

Black-necked Stork and Painted Snipe (*Ephippiorhynchus asiaticus* and *Rostratula australis)*

The Black-necked Stork and Painted Snipe have widely different habits, but may be located in similar habitats. Both species are highly vagile and it is unlikely that they will be affected by direct mortality, increased competition rising from displacement or population isolation/fragmentation. Furthermore, large losses of habitats are unlikely as low-lying areas have engineering constraints preventing the construction of large infrastructure. Linear infrastructure, such pipelines across waterways is unlikely to result in long-term impacts provided final landforms are stable.

Optimal habitat for both species at Lake Broadwater is not expected to be affected.

Square-tailed Kite and Little Pied Bat (*Lophoictinia isura* and *Chalinolobus picatus)*

Both these species are highly mobile and tolerant to small scale clearing and fragmentation. It is not expected that deleterious impacts on these species will occur.

Glossy Black-Cockatoo (*Calyptorhynchus lathami)*

Glossy Black-Cockatoos are highly vagile and consequently direct mortality, population isolation or fragmentation and edge effects are not likely to affect these species. However, they are dependent

on suitable foraging resources (predominantly Belah) and suitable large nesting hollows. While stands of belah are scattered throughout the project area, birds forage on select trees, ignoring apparently similar nearby specimens. The loss of individual feed trees can therefore have a disproportionate impact. Vegetation clearing could therefore impact local populations by either removing nesting hollows or vital foraging resources.

Regent Honeyeater, Black-chinned Honeyeater (*Anthochaera Phrygia* and *Melithreptus gularis*).

Limited suitable habitat for these species occurs within the project area. Records are likely to reflect dispersing or nomadic individual or small groups responding to local flowering of Eucalypts such as *E. tereticornis*. It is not likely that the development will result in a significant loss of habitats dominated by *E. tereticornis*, and given their sporadic occurrence, impacts are likely to be minimal. The development is unlikely to result in an increase in adult mortality or create movement barriers.

Painted Honeyeater *(Grantiella picta)*

Current observations suggest that habitat for this species is limited to two areas (see **Section 5.2.5)**. In both cases, the extent of vegetation is minor and loss of this vegetation for any potential pipeline corridors will significantly reduce resources. The severity of this impact is largely dependent on the importance of these locations to resident or season visitors. Given the small extent of habitat present, avoidance of these areas may be the most conservative approach.

With the exception of the discussed above (Regent Honeyeater, Cotton Pygmy-goose), migratory species within the project area are common, or likely to be largely restricted to Lake Broadwater. Proposed gas extraction activities are not likely to significantly impact migratory species.

6.7 Other Impacts

In addition to the above, several other impacts warrant consideration including:

- trapped wildlife in open trenches created while laying pipeline infrastructure;
- creation of evaporation ponds; and
- salination of natural nearby wetlands due to dispersal of saline groundwater from leaking well heads.

During the construction of well fields, pipes will be buried beneath the ground. This process requires trenches to be open for several nights. The trench poses a significant movement barrier for terrestrial fauna species, particularly frogs, snakes, reptiles and small mammals. An high number of these vertebrates are trapped when they fall into the trench. Trapped animals are susceptible to desiccation, predation or even death when the trench is closed. This has the potential to impact both common and EVR species alike.

The liberation of coal seam gas also produces water. Excessive surface water has both positive and negative impacts on local vertebrate communities when fresh, valuable watering points are created for a number of species, including some EVR species (e.g. Glossy Black-Cockatoo). However, surface water also increases the number of predators and exotic species (e.g. Cane Toad). To preserve natural faunal population dynamics, the creation of surface water bodies should be limited wherever possible and siting should target degraded, non-remnant areas. Many native mammals are adapted to survive in arid environments and the deleterious effects of open waterbodies are considered to outweigh benefits.

7. Recommendations for Management/ Mitigation

7.1 Management of Land Clearing and Habitat Fragmentation

The extent of vegetation removal should be minimised where ever possible. Impacts related to land clearing may be reduced through sensitive infrastructure design. Use of a qualified ecologist to review conceptual designs may be of considerable benefit to ensure site selelction criteria are met. Consideration should be given to the measures listed below.

- Vegetation disturbance should be minimised wherever possible. Well gathering corridors should be as narrow as possible, particularly when crossing linear corridors of vegetation (e.g. Condamine, Wilkie Creek, some roadside reserves). Well pads should be as small as possible.
- *E. tereticornis* and *E. populnea* trees should be visually inspected prior to clearing to ensure they are free of Koalas. If Koalas are located, the tree should be retained overnight. Vegetation surrounding the tree may be cleared. Koalas typically relocate overnight to nearby vegetation, avoiding death or injury.
- Machinery operators should keep vigilant watch for any injured vertebrates (including snakes and lizards) resulting from clearing activities. Injured wildlife should receive veterinarian treatment.
- An induction for clearing contractors may be required to inform them of their obligations in regards to the above recommendations.

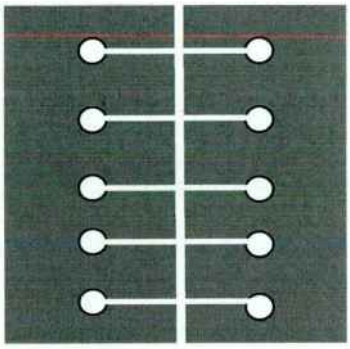
The design and site selelction of wells, gathering lines and access tracks should consider the reccomendations listed below.

- Attempt to locate them within previous clearings or non-remnant vegetation if possible. Wells should be located along existing easements wherever possible, and innovative solutions such as non-linear corridors should be investigated (i.e. curves and bends around patches). A minor deviation of less than 30m for example, would have avoided shrinkage of habitat at site AS05 (MA1).
- Construct them within previously disturbed vegetation in preference to areas with higher biodiversity values.
- Design to avoid large undisturbed tracts of remnant vegetation. Where collection and gathering infrastructure within large contiguous vegetation is required, collection networks should be designed to avoid dissection (see **Figure 14**).
- Track location should avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts.
- Consider employing methods to avoid high density well siting (e.g. Horizontal drilling);

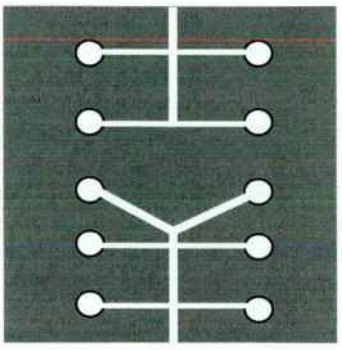
A balanced site rehabilitation plan that utilises suitable native tree and grass species should be prepared and acted upon when developed areas are no longer in use. Rehabilitation plans should consider:

- Natural re-seeding of native species wherever possible through stockpiling of any removed topsoil. Native vegetative waste should be spread over disturbed areas to provide a natural source of seed and additional fauna refuge.
- Use of native grass (or native alternative) species when rapid vegetative cover is required to prevent soil loss. Stock of local provenance should be utilised where available.
- Species utilised for rehabilitation should be specific to the original ecosystem wherever possible. For example, the use of readily available sources of *Lomandra longifolia, Carex* spp., *Chrysopogon filipes* and *Arundinella nepalensis* would enhance rehabilitation efforts in riparian ecosystems (RE11.3.4 and RE11.3.25).

Figure 13. Designing well gathering lines to avoid fragmentation



Well gathering lines resulting in dissection



Well gathering lines avoiding dissection

7.2 Management for the reduction of Edge Effects

Some edge effects are unavoidable, however deleterious effects may be reduced if structural differences between cleared areas and adjacent native vegetation can be minimised. Accordingly, the following recommendations are provided.

- Woody debris, logs and rocks should be retained for rehabilitation. At the very least, these should be piled along the edge of the cleared corridor. However spreading these features over part, or all of the corridor is highly preferred as they will provide refugia for crossing fauna. Systematic removal of surface debris should be avoided.
- Well gathering lines should be seeded with grasses and small shrub species (e.g. *Acacia montana*) to provide soil stability and cover. While the use of exotic grass species (e.g. Rhodes grass) is acceptable in existing clearing areas, the use of exotic grasses in remnant or regrowth vegetation should be avoided. The use of exotic grasses in native vegetation will exacerbate and accelerate edge effects.
- All machinery involved in clearing vegetation and trench construction (including light vehicles) should be thoroughly washed prior to, and following site access to reduce weed spread.
- A site rehabilitation plan that utilises suitable native tree and grass species should be prepared and acted upon when infrastructure in native areas (including well pads) are no longer required for operation.

7.3 Impact Management for Environmentally Sensitive Areas

No work should be undertaken within Category A and Category B ESAs or within disturbance exclusion zones erected. DERM's disturbance exclusion zones of 1000m from a Category A ESA and 500m from a Category B ESA for Level 2 Petroleum Activities can be considered a useful starting point. Where these buffer zones cannot be maintained, strict management protocols should be implemented detailing how habitat degradation within these areas can be managed. These protocols are detailed below.

- There is a requirement to develop procedures that detail weed hygiene requirements for all vehicles and machinery.
- Ensuring access points and work sites are contained to defined disturbance areas and do not stray from these areas. Access of workers and equipment outside defined areas should be undertaken by special permit only.
- Undertaking weed maintenance within the sensitive areas to limit point sources for exotic species.

- Ensuring emergency shutdown protocols are capable of rapidly sealing saline groundwater leaks from well head or dam facilities. Stringent design of well head and dam facilities to minimise any uncontrolled releases into the environment; these should be accompanied by emergency shutdown protocols in the event an uncontrolled release is detected.
- Develop and implement a series of procedures to be followed when work programs are completed to minimise the risk of residual impacts. This may include soil stabilisation and rehabilitation of worksites, weed control and regular site inspections. Photographic monitoring of decommissioned worksites may be beneficial.

All worksite personnel should be made aware of the location of these sensitive habitats and educated in regard to necessary site access protocols and requirements.

Generic recommendations made in the 'Regional Vegetation Management Code for Brigalow Belt and New England Tableland (DNR&W, 2006) require than no clearing be undertaken:

- within 100m of any natural wetland (Long Swamp) within 200m of any natural significant wetland (Lake Broadwater);
- within 50m of a stream of the 1st or 2nd order;
- within 100m of a stream of the 3rd or 4th order, and
- within 200m of a stream of the 5th order or greater.

These guidelines should be maintained within the project area wherever possible and management protocols and risk assessment tools developed wherever these buffers cannot be adhered to.

7.4 Management of Impacts to Floristic Values

7.4.1 Management of Impacts to Significant Vegetation Communities and Regional Ecosystems

Accurate vegetation mapping at a scale suitable for site specific planning should be prepared over all areas subject to immediate potential impact. Certified RE mapping (DERM version 6.0, 2009) for the project area is prepared and 1:100,000 scale and does not provide representation for remnant vegetation polygons of less than 5 ha. Field survey determined that the certified RE mapping is unreliable in terms of vegetation classification and often underestimates the extent of remnant vegetation. Property scale (1:50, 000) vegetation maps have been prepared during the course of this study to provide more accurated constraints mapping . The coverage of this mapping will be extended during the EIS period. Submission of revised mapping to the Queensland Herbarium for certification should be undertaken where it differs significantly from existing mapping, particularly where differences involve significant or sensitive vegetation types. Additional recommendations include:

- identification of the location of all EPBC and VMA significant vegetation communities (endangered and of concern) within the vicinity of disturbance areas and avoidance of these areas where alternative pathways are identified:
- ensuring all workers including contract plant and machinery operators are aware of the location of significant remnant vegetation and are guided by qualified personnel when clearing is undertaken, and
- marking all disturbance areas on the ground prior to clearing to ensure unnecessary or unintended impact is avoided.
- reduction in the width of construction easements of the pipeline connection route in the vicinity of significant ecosystem types and riparian corridors (e.g. Wilkie Creek crossing) PCR. This mitigation technique is particulary relevant to the pipeline connection route construction where reduction in the standard construction easement width of 30m around significant vegetation may significantly reduce project impacts.

The work program should aim to avoid impact to all remnant and advanced regrowth vegetation. Where impact to remnant vegetation is unavoidable, property scale vegetation mapping should be utilised to identify whether this vegetation will trigger requirement for a vegetation management offset (VMO's are required for 'endangered' and 'of concern' vegetation) under DERM's *Policy for Vegetation Management Offsets* (2008). Development of a VMO plan in consultation with DERM will be required where impacts to ecosystems requiring offsets are unavoidable.

7.4.2 Flora Species Management

Field surveys identified the presence of two EVR flora species within the project area with a further 10 species noted to potentially occur. General mitigation measures to avoid or minimise impacts to these species are detailed below:

- Avoid disturbance to all remnant vegetation wherever possible.
- Avoid disturbance to habitats known to support significant flora species wherever possible in particular palustrine wetlands and derived grassland habitats on alluvial clay soils.
- Initiate a 'no net loss' policy in regard to species numbers or sustainability of significant flora species.
- Conduct pre-construction/pre-clearing surveys in habitats known or which have the potential for EVR flora species in order to identify the location of all EPBC and NCA significant species within the vicinity of disturbance areas.
- Surveys for target grass species such as *Digitaria porrecta, Bothriochloa biloba,* and *Homopholis belsonii* to occur in optimum times (in the window following rainfall to allow growth of fertile material for identification).
- Implement environmental protection zones in close proximity to clearing zones for any populations or EVR habitat by fencing and signage.
- Develop and implement a management plan for the control of invasive weed species including weed hygiene procedures, regular weed monitoring during and after construction and weed control works.
- Effective sediment and erosion control systems are required to minimise impacts on surrounding areas, particularly in riparian habitats and palustrine wetlands. This includes procedures to control leaking wells/pumps to prevent saline water interacting with sensitive riverine and wetland environments.
- Where disturbance to populations of EVR flora is unavoidable, consider translocation protocols identified in Vallee *et al.* (2004). Establish additional populations if necessary and feasible according to best practise principles. These include adherence to policy and permit requirements relevant to the removal of EVR flora species; liaison with relevant agencies and experts; commencement of translocation prior to construction into retention areas; prior seed collection and propagation to replace individuals that are destroyed as a result of construction or do not survive translocation programs.
- Utilise existing Recovery Plans and threatened species advice statements.

7.5 Management of EVR Vertebrate Values

Strategies outlined in **Sections 7.1** to **7.3** will benefit both common and EVR vertebrates. Additional recommendations relating to EVR species include the following:

- Remnant vegetation at the Stratheden IPF has high conservation values due to the presence of Glossy Black-Cockatoo food trees and suitable nesting structures (large-hollow bearing trees). Alternative sites should be investigated;
- Foraging evidence and resources for Glossy Black-Cockatoos were also located in the production well area at the location of about 1km to the west of Lake Broadwater (see **Figure 9b).** This area also had a high abundance of mistletoe and represents potential habitat for Painted Honeyeaters. Clearing activities within this vegetation patch should be avoided;

- Other areas of vegetation with abundant Belah should be avoided as these may be used by local Glossy Black-Cockatoo populations. Typically, these coincide with RE 11.3.1, 11.3.17, 11.4.3 and 11.9.5;
- Roadside vegetation along Ducklo-School Road near the first corner heading south off the Duleen-Daandine Rd (S27.199, E151.018) has abundant mistletoe and may represent Painted Honeyeater habitat. This vegetation is shown on **Figure 7a** as 'RE_pop' to the immediate north of Strathedon IPF.

7.6 Management of Other Impacts

Capture of terrestrial animals in open trenches poses a significant impact to both common and EVR species. Several strategies relevant to construction of both gathering lines and the larger sales gas pipeline connection are often used to avoid these impacts as detailed below.

- Minimising the time trenches are open. Laying and burying of pipes should occur as soon as possible after the trench has been created.
- Construction of exit points along the trench when it passes through or is within 1km of native vegetation. Exit points may be created by digging a sloped ramp approximately 0.5-1m wide from the bottom of the trench to the surface. Trapped animals (e.g. wallabies, bettongs) may use these to exit the trench.
- Trenches should be checked and trapped frogs, lizards, snakes, mammals (e.g.) removed on a daily basis *prior to* laying pipes and closing trenches (i.e. shortly after sunrise). Captured animals may be relocated to nearby vegetation. This process will be facilitated by:

    - Locating two sawdust/wood filing filled hessian bags (to provide shelter for trapped animals) at the base of the trench approximately every 200m when passing through native vegetation.
    - Locating the above bags approximately every 400m when passing through disturbed land.
    - Bags may be moved prior to trench closing. Additional bags may be positioned wherever high fauna activity is likely.
    - Clearing of trenches should be undertaken by a suitably qualified animal handler or ecologist.

- Details of trapped and released animals should be recorded (e.g. date, GPS location, species, condition) for inclusion into the DERM WildNet database. This will provide valuable information on the types of animals within the region and may provide additional information for any EVR species.

Water derived from gas extraction activities should not be collected in nearby small dams or allowed to pool on the surface if possible, however, it is understood that this will be largely unavoidable when conducting drilling activities in more islolated areas. In this event, the length of time that the dams exist should be limited, and the areas progressively rehabilitated as soon as possible after the completion of works. Water would preferably be transported to large reservoirs in existing cleared areas where it will not facilitate the movement of pest species into native habitats. Large reservoirs will inadvertently attract native aquatic species to locations where they may have previously been absent. However, large ponds in existing cleared areas will have less impact on ecological function than many small pools.

8. Recommendations for Ecological Enhancement

Opportunities for environmental improvement include the following.

- Fencing and managing regrowth vegetation within Arrow-owned land to ensure its long-term viability. This may be of particular value if Brigalow and *C. cristata* regrowth is permitted.
- Fencing and managing highly sensitive habitats such as native or derived grasslands.
- The improvement of existing corridors through buffer planting. Two areas are worthy of particular note include:
  - vegetation along the Condamine river.
  - vegetation along Ducklo-school road between Wilkie Creek and site to the immediate north of proposed Strathedon IPF. This is likely to be the only corridor allowing Koala movement between these two foraging areas and its improvement will undoubtedly benefit this species and possibly several others.
- Establishment of new corridors through the connecting of existing remnant fragments. Connection of vegetation around the regionally important Lake Broadwater to Wilkie Creek in the west provides an exciting possibility. Other opportunities to connect vegetation exist around the Lynwood North IPF and MA4;
- Active control of declared species under the LPA (2002) including Prickly Pear (*Opuntia stricta*), Mother of Millions (*Bryophyllum delagoense*) and Harrisia Cactus (*Eriocereus spp.*). These species are particularly prominent on heavy clay soils associated with RE11.3.1, RE11.4.3 and RE11.3.17. Heavy infestations are noted in the area of the proposed Strathedon IPF and well areas of MA2 formed To the immediate south.

9. Additional Recommendations / Work Requirements

The inaccuracy in existing certified RE mapping underpins a recommendation that map amendment requests be submitted as soon practical to the Queensland Herbarium to register mapping produced during this exercise, particularly where major discrepancies are identified in respect to incorrect classification of Category B ESAs and endangered vegetation types. Areas recommended for amendment submission in order of priority are;

- MA2 encompassing the proposed Strathedon IPF, the entirety of PL252, and the Long Swamp Area (within MA2);
- Lynwood North IPF, andTheten IPF.

Amendments made to mapping in these areas will assist the provision of certainty to all aspects of vegetation management including facility site location, establishment of appropriate buffers and VMO planning if necessary.

Brigalow/*A. cristata* communities and derived/native grasslands are particularly sensitive in respect to both vertebrate fauna and flora values. Where possible these areas should be avoided. However, if unavoidable, further trapping assessment of these habitats is crucial for understanding impact severity.

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C

Queensland Government

Enquiries s. 47F(1)
Telephone
Your reference 2010/5343
Our reference BNE 683-45

Department of
Environment and Resource Management

19 February 2010

Mr James Barker
Director
Mining Section
Environment Assessment Branch
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
CANBERRA ACT 2601

Dear Mr Barker

Invitation to comment on referral - Dalby Expansion Project, Qld (EPBC 2010/5343)

I refer to your correspondence of 2 February 2010 requesting advice on whether the above action will be assessed in a manner described in Schedule 1 of the *Agreement between the Commonwealth of Australia and the State of Queensland* (the Agreement) developed under Section 45 of the *Environment Protection and Biodiversity Conservation Act 1999*.

I advise the proposal will not be assessed using the EIS process in chapter 3 of the *Environmental Protection Act 1994*. DERM has received an application for a level 1 Petroleum Activity for the proposal under the *Environmental Protection Act 1994*.

The Department of Infrastructure and Planning (DIP) has reviewed the referral documentation and advise that the Coordinator-General has not received a request for declaration of this proposal as a significant project under Part 4 of the *State Development and Public Works Organisation Act 1971*.

Also, the DIP has advised the proposed development is unlikely to meet the requirements for assessment under Chapter 9, Part 2 of the *Sustainable Planning Act 2009*.

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Should you have any further inquiries regarding this letter, please contact s. 47F(1) of DERM on telephone s. 47F(1) or email s. 47F(1) @derm.qld.gov.au .

Yours sincerely

s. 47F(1)

Director
Environmental Impact Assessments

Australian Government
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ASEPE/OUT/2010/ 2

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DEFENCE COMMENTS ON EPBC ACT REFERRAL 2010/5344 – ARROW ENERGY SURAT BASIN GAS FIELD DEVELOPMENTS, DALBY

1. Thank you for inviting Defence to comment on the proposal by Arrow Energy to increase the production capacity of its Surat Basin operations through the Dalby Expansion Project, which has been referred to your Department for consideration under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2. The project will involve the development of up to 300 new production wells, two integrated production facilities and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure approximately 20 to 40kms west of Dalby, and 200kms west of Brisbane, Qld.

3. Having reviewed the referral documentation, Defence considers the project unlikely to have any impacts on Commonwealth land.

4. Should you wish to discuss this project further, please contact s. 47F(1)

s. 47F(1)

Terry Weston
Assistant Secretary
Estate Policy and Environment
18 February 2010

D

Water Reform Division EPBC Act Referral Checklist for Proposals not expected to have significant impacts on a Ramsar site.

Referral: 2010/5343

Date Due Back to AWD: 22/02/2010

Arrow Energy / Energy generation and supply (non-renewable) / Surat Basin / QLD / Dalby Gas Expansion Project:

Brief Description:

The proposed action is to expand Arrow Energy's production capacity in existing coal seam gas (CSG) field operations in the Surat Basin, QLD, through the Dalby Expansion Project. The gas fields are located 20 to 40 km south and west of Dalby.

The action includes up to 300 new production wells, two integrated production facilities including gas compression, water treatment, and power generation, and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure.

Construction activities are scheduled to occur between 2010 and 2012, with wells expected to be drilled at the rate of 10 to 15 wells per month and have a production life in excess of 20 years. The approximate area for new well development will be 126 ha. Gathering pipelines between the wells and production facilities will require 30 m width corridors and access tracks will be 3 m wide. Integrated production facilities require 132.5 ha. High pressure gas pipelines will be 5 km by 30 m and 50 km by 30 m, thus requiring 165 ha.

This action is related to Arrow Energy's Surat Gas Project (EPBC 2010/5344), for CSG operations in a larger area which overlaps with the Dalby Gas referral action area and involves up to 1,500 wells, four integrated production facilities and high pressure gas pipeline.

Issues Checklist:

How far is the proposal from a Ramsar site?

The action site is within the same surface water catchment (Condamine-Culoga Rivers Basin) as the Narran Lake Nature Reserve (NLNR) Ramsar site and the same ground-water catchment (GAB) as both the NLNR Ramsar site and the Gwydir Wetlands (GW) Ramsar site. The NLNR is approximately 450 km from the proposed action site or approximately 600 km stream-distance, and the GW are approximately 250 km from the proposed action site with no surface water connection.

Is the proposal likely to result in a significant:

- extraction or diversion of ground or surface waters within a Ramsar catchment?

Yes ☐ No ☒

- land use change resulting in changes to groundwater recharge, runoff quantity or quality within a Ramsar catchment? Yes ☐ No ☒
- release of contaminants within a Ramsar catchment? Yes ☐ No ☒
- increases in levels of human activity or other disturbance within close proximity of a Ramsar site? Yes ☐ No ☒
- loss or modification of habitat important for species that make up the ecological character of the Ramsar site? Yes ☐ No ☒
- risk of introducing or spreading invasive flora or fauna within a Ramsar catchment? Yes ☐ No ☒

Are there any other activities with potential to cause significant impacts either directly or as a consequence of the proposal Yes ☐ No ☒

If Yes to any of the above, provide explanation of how these would be successfully managed.

Has AWD forwarded any public comments to WRD Yes ☐ No ☒

If Yes, note details of comments forwarded to WRD below:

Agency, Organisation, Person	Comments

Issues to note:

The NLNR is approximately 450 km from the proposed action site or approximately 600 km stream-distance, and the GW are approximately 250 km from the proposed action site with no surface water connection.

The Surat Basin Coal Seam Gas (CSG) operations (of which the proposed action are a part) lie within the Walloon Coal Measures. The CSG Water Management Study conducted by Queensland Department of Natural Resources, Mines and Energy (QLD DNRME, 2004) states that the Walloon Coal Measures are not considered to be hydrologically connected to the GAB aquifers – thus it can be concluded that groundwater effects of the proposed action would not extend to the NLNR or the GW.

s. 22(1)(a)(ii), (Senior Principal Research Scientist - Water Resources, Water Reform Division, DEWHA) a groundwater expert with over 20 years experience and a masters degree in hydrology and water resources, was not convinced about the Walloon Coal Measures not being hydraulically linked to the GAB aquifers, noting QLD DNRME's qualifier that there were no site specific assessments to support their statement, and until such assessments are conducted no detailed estimation of groundwater impact due to CSG development can be undertaken. Despite this, Mr Baker considers that it is still unlikely that the referred action will impact on the NLNR Ramsar site or the GW Ramsar site because there is no evidence to indicate that either Ramsar site relies on GAB groundwater. Though the groundwater dependence of the NLNR and GW Ramsar sites is unknown, both are largely floodplain systems, and as such, the deep groundwater aquifers of the GAB are not expected to play a large part in their hydrology.

The approximate 600 km stream-distance between the NLNR Ramsar site and the site of the proposed action is likely to be sufficient to ameliorate any potential surface-water quality impacts caused by the action. Additionally, sediment controls and buffer zones will be implemented when working near watercourses to avoid or reduce impacts to

water quality and fish.

Consequently, on the basis of information made available to the Department, a significant impact on the ecological character of the Narran Lake Nature Reserve Ramsar site or the Gwydir Wetlands Ramsar site is not expected or likely.

Cleared by: s. 22(1)(a)(ii) Assistant Director, Wetlands Section

Signature: .....s. 22(1)(a)(ii)
Date:

Cleared by relevant Director (s): Yes ☐ No ☑

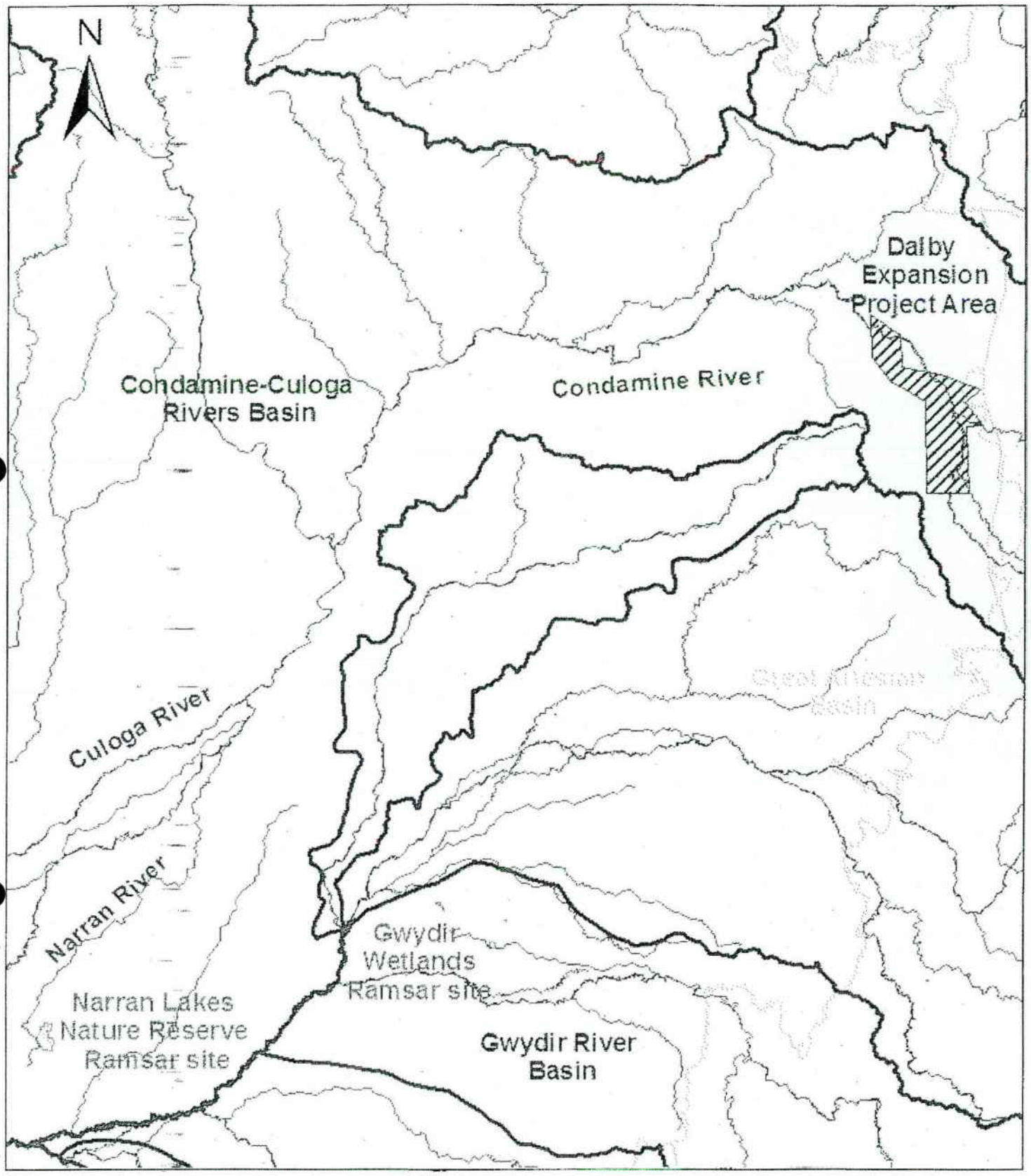
Cleared by: Chris Schweizer, Assistant Secretary, Aquatic Systems Health Branch

s. 47F(1)

Signature: ....
Date: 8/3/10

Sources:

- ESRI (1999-2008) ArcGIS
- Baker, P. (2010) DEWHA Water Planning Section, Personal communication
- Queensland Department of Mines and Energy, Department of Employment, Economic Development and Innovation (2009) Queensland's coal seam gas overview. Accessed February 2010, available from http://www.dme.qld.gov.au/mines/coal_seam_gas.cfm
- Queensland Department of Natural Resources, Mines and Energy (QLD DNRME) (2004) Coal Seam Gas Water Management Study. Accessed February 2010, available from http://www.dme.qld.gov.au/mines/csg_water_management_study.cfm
- Ramsar Information Sheet (RIS) for the Narran Lakes Nature Reserve Ramsar site (1999) and the Gwydir Wetlands Ramsar site (1999)
- Referral documentation



2010/5343
Dalby Expansion Project

0 50 100 200 Km

Ramsar sites
Drainage 10m
Drainage 5m
Drainage Basins
Groundwater Provinces

Australian Government

Department of the Environment, Water, Heritage and the Arts

Heritage Division

Advice ID: 11005 (Heritage Division Advice Record No.)
To: s. 22(1)(a)(ii) Mining Section
Date: 18 February 2010
Officer: s. 22(1)(a)(ii), Heritage Information Section
Contact: 6274 2457

Input to: **Referral EPBC 2010/5343 s26 Arrow Energy/Energy generation and supply (non-renewable)/Surat Basin/QLD/Dalby Gas Expansion Project** under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) provisions: s26

Proposal:
The information provided by the person proposing the action states that Arrow Energy (Arrow) proposes to increase the production capacity of its Surat Basin operations through the Dalby Expansion Project. The project will involve an expansion of existing gas field operations within the Tipton West, Daandine, Stratheden and Kogan North, and through the initial development of Plainview, Long Swamp and Meenawarra gas fields. The gas fields are located 20 to 40 km south and west of Dalby, in Queensland's Surat Basin.

The Dalby Expansion Project will involve the development of up to 300 new production wells, two integrated production facilities including gas compression, water treatment, power generation and high pressure gas pipelines that will connect the facilities to existing and proposed sales gas delivery infrastructure. Activities are scheduled to occur between 2010 and 2012.

Gas produced from the nominated fields will maintain supply under existing domestic gas sales agreements and confirm a viable gas supply to proposed export LNG projects.

Advice:
While the proposed action is to be carried out in the vicinity of Commonwealth Land, there are no places on the heritage lists, relating to the Australian Government's responsibilities under the EPBC Act (World Heritage List, National Heritage List, Commonwealth Heritage List and Register of the National Estate), that are in the vicinity of, or likely to be significantly impacted by the proposed action.

s. 22(1)(a)(ii)
Director
Heritage Information Section
Heritage Division

E

Australian Government

Department of the Environment, Water, Heritage and the Arts

Notification of REFERRAL DECISION – not controlled action if undertaken in a particular manner

Dalby Expansion Project (EPBC 2010/5343)

This decision is made under sections 75 and 77A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Arrow Energy ACN: 078521936
proposed action	To increase the production capacity of the Surat Basin operations through the initial development of gas fields and expansion of existing gas fields near Dalby, Queensland and as described in the referral received under the EPBC Act on 2 February 2010.

Referral decision: Not a controlled action if undertaken in a particular manner

status of proposed action	The proposed action is not a controlled action provided it is undertaken in the manner set out in this decision.

Person authorised to make decision

name and position	Mary Colreavy Assistant Secretary Environment Assessment Branch
signature	s. 47F(1)
date of decision	16 April 2010

manner in which proposed action must be taken

The following measures must be taken to avoid significant impacts on listed threatened species and communities (sections 18 & 18A).

- Prior to any vegetation disturbance, pre-clearance surveys must be conducted in areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are present, likely to occur or have the potential to occur.

  These pre-clearance surveys must be undertaken by a suitably qualified person. If the surveys cannot be conducted at optimum times for the relevant EPBC-listed species, their presence should be assumed and avoidance and minimisation measures implemented.

  A record of the survey and results must be kept and submitted to the Department on request.

(continued next page)

- In areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are likely to be impacted by the proposed action, the person taking the action must implement avoidance measures so as to have no significant impact on those species or communities.

  Demonstration of the avoidance measures undertaken must be provided to the Department on request.

- In areas where impacts to EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species cannot be avoided, the person taking the action must minimise potential impacts by implementing Arrow Energy's Environmental Management Standard Operating Procedures as provided in the referral submitted on 2 February 2010, or subsequent versions that incorporate but do not reduce or remove the environmental management procedures set out in that version of the documents, for: vegetation and habitat; site disturbance; ground disturbance and erosion; weed and pathogen; and rehabilitation.

  Demonstration of minimisation measures must be provided to the Department on request.

Australian Government

Department of the Environment, Water, Heritage and the Arts

s. 47F(1)
Environment Manager
Arrow Energy
Level 19, AM60
42-60 Albert Street
BRISBANE QLD 4000

Date: 16/4/10
EPBC Ref: 2010/5343
EPBC contact: s. 22(1)(a)(ii)
@environment.gov.au

Dear s. 47F(1)

Decision on referral
Dalby Expansion Project (EPBC 2010/5343)

This is to advise you of my decision, under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, about the proposed action to increase the production capacity of the Surat Basin operations through the initial development of gas fields and expansion of existing gas fields near Dalby, Queensland.

I have decided that the proposed action is not a controlled action, provided it is taken in accordance with the manner described in the enclosed decision document This means that, provided that the action is undertaken in that way, it does not require further assessment and approval under the EPBC Act before it can proceed.

A copy of the document recording this decision is enclosed. This document will be notified publicly on the Department's website.

Please note that this decision relates only to the specific matters protected under Chapter 4 of the EPBC Act.

This decision does not affect any requirement for separate state or local government environment assessment and approvals of the proposed action.

Please notify this Department immediately if you are unable to undertake the proposed action in accordance with the measures described. Penalty provisions may apply if the referred action is undertaken in a different way to the manner specified.

Otherwise we would appreciate receiving your written advice:

- within two weeks of the date of this letter - confirming that the action will be undertaken in the manner set out in the enclosed decision, and
- within three months of the date of this letter - reporting on your progress in implementing the measures.

The Department has an active audit program for proposals that have been referred under the EPBC Act. The audit program aims to ensure that there is a high degree of compliance with decisions made in relation to those proposals. You should be aware that your project may be selected for audit by the Department at any time and all related records and documents may be subject to scrutiny. Information about the Department's audit strategy is enclosed.

If you have any questions about the referral process or this decision, please contact the EPBC project manager and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

s. 47F(1)

Mary Colreavy
Assistant Secretary
Environment Assessment Branch

Australian Government

Department of the Environment, Water, Heritage and the Arts

s. 47F(1)
Director
Environmental Impact Assessments
Department of Environment and Resource Management
GPO Box 2454
BRISBANE QLD 4001

Date: 16/4/10
EPBC Ref: 2010/5343
EPBC contact: s. 22(1)(a)(ii)
@environment.gov.au

Dear s. 47F(1)

Decision on referral
Dalby Expansion Project (EPBC 2010/5343)

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Yours sincerely

s. 47F(1)

Mary Colreavy
Assistant Secretary
Environment Assessment Branch

Australian Government

Department of the Environment, Water, Heritage and the Arts

s. 47F(1)
Senior Consultant
Coffey Natural Systems
Level 21, 12 Creek Street
BRISBANE QLD 4000

Date: 16/4/10
EPBC Ref: 2010/5343
EPBC contact: s. 22(1)(a)(ii)
s. 22(1)(a)(ii)
s. 22(1)(a)(ii)@environment.gov.au

Dear s. 47F(1)

Decision on referral
Dalby Expansion Project (EPBC 2010/5343)

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Please note that this decision relates only to the specific matters protected under Chapter 4 of the EPBC Act.

This decision does not affect any requirement for separate state or local government environment assessment and approvals of the proposed action.

If you have any questions about the referral process or this decision, please contact the EPBC project manager and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

s. 47F(1)

Mary Colreavy
Assistant Secretary
Environment Assessment Branch

F

arrow energy
go further

19 February 2010

Ref: ENV10-024

Mr James Barker
Mining Section
Environmental Assessment Branch
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
CANBERRA ACT 2601

Dear Mr Barker

Dalby Expansion Project (EPBC 2010/5343) and Surat Gas Project (EPBC 2010/5344)

Thank you for your letter dated 8 February 2010, requesting additional information on why the Dalby Expansion Project and the Surat Gas Project for which referrals have been submitted should not be considered parts of a larger action pursuant to Section 74A(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Dalby Expansion Project is a continuation of Arrow's existing activities in the areas west and south of Dalby. It involves expansion of existing gas production facilities, namely gas wells, gas compression, power generation and water treatment facilities to enable full development of the targeted coal seam gas fields. The Dalby Expansion Project will proceed independently and irrespective of whether the Surat Gas Project proceeds, as its purpose is to fulfil domestic gas supply agreements and inform our understanding of the performance of the gas reservoir.

Arrow's existing facilities have not previously been referred as they have not impacted on Matters of National Environmental Significance (MNES).

The proposed Dalby Expansion Project has been referred because its activities are within proximity to EPBC Act listed vegetation communities, however the scope of expansion activities are well defined with known locations for all facilities and extensive studies and mapping of all areas of environmental significance. Arrow considered it prudent to submit a referral for this development to ensure transparency in relation to our current activities and to demonstrate that avoidance of any potential impacts on MNES is achievable. The referral has demonstrated that infrastructure can be sited to avoid MNES and consequently Arrow has nominated the proposed activities of the Dalby Expansion Project as 'not a controlled action'.

The activities within the Dalby Expansion Project are clearly defined , and the majority of the activities are already approved under 'environmental authorities' issued by the Queensland Department of Environment and Resource Management.

In contrast, the Surat Gas Project is primarily proposed to supply coal seam gas to proposed export LNG projects at Gladstone. New integrated production facilities (featuring gas compression, power generation and water treatment), gas wells and gathering systems will be developed throughout the project area (some 8,000 km^2), which includes the geographic area covered by the Dalby Expansion Project. However, facilities contemplated in the Surat Gas Project exclude the scope of activities proposed in the Dalby Expansion Project.

The Surat Gas Project is currently at an early stage of development planning and as such, the uncertainty about the proposed location of coal seam gas infrastructure warrants the Surat Gas Project being subject to an environmental impact assessment. Arrow has consequently volunteered to prepare an Environmental Impact Statement under the *Environmental Protection Act 1994* (Qld) and has nominated the proposed action a 'controlled action' under the EPBC Act with an expectation that the Queensland assessment process would be endorsed as the appropriate level of assessment.

Therefore, a single referral covering the Dalby Expansion and Surat Gas projects would not be appropriate in this instance for the following reasons:

- The specific activities proposed in the Dalby Expansion Project are separate activities to those contemplated in the Surat Gas Project, even though they may occur in the same geographic area.
- The Dalby Expansion Project will proceed regardless of whether the Surat Gas Project proceeds and therefore it is appropriate for it to be considered a separate project and assessed independently.
- An assessment of environmental impacts associated with the Dalby Expansion Project has been undertaken and Arrow has demonstrated in the referral that MNES have been avoided.

In addition, a requirement to address potential impacts of both projects in a single assessment process (the result of submitting a single referral covering both projects) would result in a moratorium on coal seam gas development required to fulfil existing domestic gas agreements. It would put at risk fulfilment of existing contracts.

Given the potential impact on Arrow's current activities, it would be appreciated if you would consult with Arrow on any further information required to inform your assessment of whether Section 74A(1) applies in this instance before making a decision.

Please contact me by phone on s. 47F(1) or email s. 47F(1)@arrowenergy.com.au or s. 47F(1) on s. 47F(1) or email s. 47F(1)@arrowenergy.com.au if you require any further information.

Regards,

s. 47F(1)

Environment Manager

G

Environment Protection and Biodiversity Conservation Act 1999

Guidance Note

Particular Manner: sections 75 and 77A, EPBC Act

This guidance note is intended for use only by staff of the Department of the Environment, Water, Heritage and the Arts. It should not be relied upon by any other person. The policies and procedures included in this Guidance Note are intended to serve as guidance only and should be applied consistently with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999*. Please also note that this Guidance Note is subject to change without notice.

Contents

Overview

What is a 'Not Controlled Action-Particular Manner (NCA-PM) decision'?

The purpose of this Guidance Note is to outline the requirements for making a 'NCA-PM' decision under s.77A of the EPBC Act.

A NCA-PM decision is a decision that a proposed action will not be a controlled action if it is taken in a "particular manner". The "particular manner" is taken from the person's referral documentation which includes information in the referral form itself, as well as any other information provided to the Department prior to the section 75 decision (see step 1, below). This means that NCA-PM decisions cannot impose "conditions". Rather, a NCA-PM decision requires the person to follow identified elements of their own proposal. Where the person does not follow those elements, they may be subject to compliance and enforcement action under EPBC Act s 77A(2).

NB. In the past the Department has also used the term "specified manner" to describe this kind of decision. There is no difference between the two terms, but "particular manner" is preferable because it is consistent with the language used in the EPBC Act.

Refer to Environment Assessment Branch Manual (EAB Manual), Part 2H for an introductory overview on the operation of NCA-PM decisions.

What is the Purpose of NCA-PM Decisions?

NCA-PM decisions encourage people to design projects to avoid significant impacts from the outset. They therefore allow for a shorter process by avoiding the need for a full Part 8 assessment where the potential impacts of a proposed action have already been adequately considered and mitigated. This creates an incentive for people to be well-prepared and to consider fully the implications of their proposed action before referring it for a decision under the EPBC Act. The granting of NCA-PM decisions is a powerful tool for influencing the behaviour of the regulated community: delivering efficient processes and good environmental outcomes.

People making referrals should be encouraged to submit high quality, accurate, reliable and complete referrals, rather than submitting large quantities of unnecessary documentation, or referrals that are low quality, incomplete, unreliable, unsubstantiated or imprecise. Proposed actions will not be suitable for a NCA-PM decision if the referral documentation does not provide certainty about the way the action will be taken and meet high standards in relation to the avoidance or acceptable management of impacts on matters protected under Part 3 of the EPBC Act ('protected matters').

What proposed actions are suitable for a NCA-PM Decision?

To be suitable for a NCA-PM decision, the referral documentation must allow the decision-maker to:

- have reasonable certainty about the way the proposed action will be taken. This means the decision-maker must have adequate information about the way the action will be taken and believe that the action will actually be taken that way; and
- identify possible impacts that the proposed action may have on any protected matter; and
- be satisfied that the design of the proposed action either entirely avoids/prevents the possible impacts on protected matters or reduces any impacts so that they are not significant. Such proposed actions may include a contingency plan outlining what will happen in the unlikely event that the proposed action does not go according to plan.

Steps for Making a NCA-PM Decision

Work through the following steps to determine if a proposed action is suitable for a NCA–PM decision.

Step 1: Identify the relevant Controlling Provisions

The relevant controlling provisions should be explicitly or implicitly identified in the referral documentation. If not, the referral will not be suitable for a NCA-PM decision.

For information on how to identify relevant controlling provisions see the EAB Manual, part 2.

Step 2: Determine if the proposed action is suitable for a NCA-PM Decision

Clues that a proposed action might be eligible for a NCA-PM decision are:

1. The referral documentation identifies all relevant controlling provisions and all potential impacts that the proposed action may have on the matters protected by the provisions; and
2. The referral documentation describes how the proposed action will be taken in reasonable detail and with reasonable certainty, or contains a Project Management Plan (PMP) and/or a Contingency Plan (CP) which includes this information; and
3. The proposed action would ordinarily be likely to have a significant impact on a protected matter. However, the proposed action will be performed in a particular way, as specified in the referral documentation, that avoids or prevents those significant impacts; and
4. The referral documentation identifies measurable and clear procedures or mitigation measures that will be taken to prevent potentially significant impacts on protected matters or to reduce such impacts so that they are not significant; and
5. The PMP/referral documentation truly contains "mitigation measures", not just "environmental offsets". The decision-maker cannot take any beneficial impacts of the proposed action into account when making a decision under section 75 including a NCA-PM decision (see section 75(2)(b)). This means that the decision-maker cannot rely on the positive aspects of the proposed action, such as the provision of offsets, to reach the conclusion that overall there will not be a significant impact on a protected matter. Rather, the referral documentation must demonstrate that the proposed action will include measures that prevent a significant impact from occurring. These measures will generally be taken at the site of the proposed action or development, and they usually operate contemporaneously with the potentially detrimental activity. If you are not sure whether a critical element of the proposed action is a "beneficial impact" contact the Legislation Policy Section.

Other Considerations

Is the referral documentation almost suitable?

- If you can easily identify necessary changes to the proposed action which would make the action suitable for a NCA-PM decision, then it may be appropriate to enter into a dialogue with the referring party and inform them of changes that would need to be made for their proposed action to be considered as suitable for a less onerous form of assessment (either a NCA-PM decision or assessment on referral documentation).
- The referring party may be informed either verbally or in writing of the deficiencies that would need to be fixed before a NCA-PM decision could be made. All interactions, including any advice that is given verbally, must be documented and recorded on file.
- The assessment officer should not re-write the referral documentation or the referring party's commitments. The referring party must consciously choose to embrace any necessary alterations to their proposed action. The officer should merely suggest the need and reason for modification if he or she feels it is appropriate in the given circumstances.
- The referring party must write to the Department as part of this on-going discussion to confirm any changes or additional mitigation measures that are to form part of the proposed action. This document forms part of their referral documentation.
- If referring party cannot or will not make the necessary changes then their project is not suitable for a NCA-PM decision.

Does the referral documentation contain a Contingency Plan (or equivalent)?

- People making referrals should be encouraged to have contingency plans that will be carried out if the proposed action does not go as planned. To be considered a critical requirement of a proposed action these plans must be clear and certain. The best contingency plans will contain:
  - strategies for monitoring impacts; and

- adequate measures or corrective responses in the event of unforseen impacts.

A NCA-PM Decision is not suitable if:

1. The project requires the imposition of additional "conditions".

NCA-PM decisions cannot impose conditions.

For example, precise date restrictions cannot be imposed on a proposed action where the referral documentation merely states that the proposed action will occur outside the peak migration or breeding periods of a particular species. Peak migration or breeding periods can vary slightly from year to year depending on a number of factors. A fixed timeframe that allows for no flexibility would be considered a condition if the timeframe was not otherwise proposed in the referral documentation.

2. Elements of the proposed action require further approval.

If elements of the proposed action are uncertain, pending further approval by the decision-maker or another approval body, then the proposed action is not suitable for a NCA-PM decision.

For example, if the referral documentation specifies that further approval of any sort will be required if X occurs, or at a specific point in time or stage in the proposed action, then the proposed action must be assessed under Part 8 of the EPBC Act.

3. The proposed action requires further research.

If a proposed action requires further research to determine its likely impacts, or the appropriate methods/techniques that should be employed when carrying out the proposed action, it will generally not be suitable for a NCA-PM decision. Any further research to be undertaken must have a pre-determined outcome. That is, in the event of particular results, the proposed action will be taken in a pre-defined way. Where research will affect the proposed action in an unknown way it cannot be considered pre-determined, and will not be suitable for a NCA-PM decision.

This in no way prevents people from carrying out additional research that is related to their proposed action, as long as this has no bearing on how the proposed action will be taken and is not included in the NCA-PM requirements.

4. The Department would need to direct the referring party to re-write significant or sizable parts of the proposal.

Any required amendments should be capable of being easily and quickly identified and altered. Remember that NCA-PM decisions are designed to provide an incentive for people making referrals to be well-prepared and to assess their proposed action independently. They are not designed to allow people to avoid full and proper assessment of their proposed action or to put the onus of writing the proposal on the Department.

5. The project is more appropriately a not controlled action (NCA).

NCA-PM decisions should not be used as a means of monitoring projects that are unlikely to have a significant impact. NCA-PM requirements must be monitored, and should only be identified if a proposed action is likely to have a significant impact on a protected matter if the particular manner of taking the action is not followed.

6. The decision-maker is unsure about whether the proposed action will actually be taken in the manner described in the referral documentation.

In order to make a NCA-PM decision, the decision-maker must reasonably believe that the proposed action will be taken in the manner described.

If a NCA-PM is not appropriate consider whether the referral would be suitable for:

1. a not controlled action decision (EAB Manual Part 2B-2F);
2. a controlled action decision with assessment on referral documentation (EAB Manual Part 2I); or
3. a controlled action decision with assessment by a more comprehensive assessment approach (EAB Manual Part 2I).

Step 3: Define the "Proposed Action"

It is important to note that the person taking the proposed action is only required to take the action in a manner that is substantially similar to the original referral.

For this reason, the description of the proposed action on the decision instrument should not be overly detailed to allow a degree of flexibility in the way the action is taken.

The proposed action should NOT be described using the words "as described in the referral documentation submitted on DD/MM/YY". Instead it should be described on the decision instrument under the heading "proposed action" as follows:

- Insert a general description of what the person proposes to do [See EPBC Act referral No. XXXX].

- For example: "To conduct a 2D seismic survey in petroleum exploration area T/000 [See EPBC Act referral No. XXXX]."

This ensures that people are not compelled to take the proposed action precisely as described in the referral documentation. If parts of the referral are important to the judgement about the significance of the impacts then identify them in the NCA-PM schedule.

It is important to remember that if there is any significant deviation from the substantive proposals contained in the referral, then the person taking the proposed action may not be protected by the NCA-PM decision and may be subject to compliance and enforcement action.

Step 4: Formulate the Particular Manner Requirements

A NCA-PM decision must identify the elements of the proposed action which are required to mitigate or avoid impacts on protected matters.

The proposed action must not be taken inconsistently with these requirements. If a person takes the proposed action inconsistently with a requirement they may be subject to compliance and enforcement action under EPBC Act s 77A(2).

In identifying the 'particular manner' requirements (i.e. the elements of the action which must be followed), the following should be kept in mind.

1. Requirements must come from the referral documentation.

The requirements must be derived from the original referral documentation and any additional submissions provided by the person proposing to take the action. This ensures the person has actually agreed to take the proposed action in this particular manner, minimising problems with compliance and enforcement.

(If the person has not agreed to these critical requirements then the proposed action will not be suitable for a NCA-PM decision. See step 5.)

2. NCA–PM requirements are the elements of the proposed action that are so critical to the particular manner decision that they cannot be deviated from.

The requirements must be the critical elements of the proposed action that are necessary to prevent a likely significant impact on a protected matter. This will include all the parts of the proposed action that the decision-maker has relied on to make his or her judgement about the significance of the impacts on protected matters. Parts of the proposed action that have no potential impact on protected matters are irrelevant to the NCA-PM decision (i.e. they should not be listed as requirements of the proposed action in the NCA-PM schedule).

3. Requirements do not need to quote the referral documentation.

Referral documentation can be highly detailed; listing and describing precise activities or processes to be undertaken. Directly quoting this documentation may lock in details that are not necessary for the NCA-PM decision.

Instead, the requirements should simply state the critically important elements of the proposed action, without specifying precise details, where such details are inconsequential. Any detail that is essential to avoid or mitigate the impact on protected matters must be included.

For example, if it is important that an area of land be fenced off to protect a certain species, but the type of fence, the height of the fence or the precise location and parameters of the fence, are not important to the protection of the species then these additional details should not be included in the requirement. On the other hand if the type of fence is important that detail should be included.

4. Requirements must be capable of being monitored, audited and complied with.

A requirement must identify defined and measurable elements of the proposed action. You should provide a draft of all requirements to the monitoring and audit section for advice about whether they meet these criteria before providing them to the referring party (see step 5).

5. Requirements that relate to third party observers.

To be a requirement of a NCA-PM decision, the involvement of a third party must actually contribute to the risk management of the potential impacts of the proposed action. That is, the observer must not be there to simply watch the proposed action take place. Rather, they must have a degree of influence over how the proposed action is carried out.

If there is a risk that the proposed action may have a significant impact on a protected matter the observer must be capable of altering the course of the proposed action to avoid or reduce that impact.

Where a third party observer is a critical requirement of the proposed action, this observer's responsibilities, the measures that they can employ to manage the risk of impacts on protected matters and the breadth of their authority must be clearly established in the referral documentation.

Requirements that relate to third party observers should be formulated as follows:

"If X occurs, Y will be done in compliance with [description of third party observer]'s instructions".

(Where these instructions are issued in accordance with industry guidelines or professional protocols you should also name these guidelines or protocols).

For example: "If X,Y or Z species of marine wildlife come within the vicinity of the seismic operation, work will be stopped until it can be ensured that the operation will have no impact upon marine biodiversity in the area. This will be done in conformity with the Marine Mammal Observer's instructions, which shall be issued in accordance with the *EPBC Act Policy Statement 2.1- Interaction between Offshore Seismic Exploration and Whales*".

6. Requirements that relate to contingency plans

If a contingency plan is a critical element of the proposed action, the plan must be clear and certain. That is, it should specify that 'if X happens then Y will occur', rather then stating that 'if X happens we will take unknown or unspecified measures to ensure there is no adverse impact on protected matters'. If the contingency plan is uncertain, it should not be included in the particular manner requirements.

Step 5: Confirm the particular manner with the referring party

Once the particular manner requirements have been drafted, confirm with the referring party that the proposed action can, and will, be taken consistently with the particular manner as described. This confirmation should be in writing. This step ensures that you have properly understood and described the proposed action.

If necessary (and possible) you can amend the draft requirements so that they accommodate the referring party's concerns while still adequately mitigating against likely significant impacts on protected matters. If this is not possible and the referring party cannot commit to taking the proposed action consistently with the particular manner requirements, the proposed action will not be suitable for a NCA-PM decision.

Step 6: List the Controlling Provisions

The NCA-PM decision instrument should list the relevant controlling provisions at the beginning of the NCA-PM schedule using one of the following formulas:

1. General formula

The general formula should be used where the particular manner requirements relate to **all** of the controlling provisions.

"The following measures must be taken to avoid significant impacts on:

- Controlling Provision 1 (e.g. sections 18 and 18A, Listed Threatened Species and Communities)
- Controlling Provision 2 (e.g. sections 20 and 20A Listed Migratory Species)
- Controlling Provision 3 (etc...)
- List of the particular manner requirements (i.e. the way in which the proposed action must be taken)."

2. Alternative formula

If the requirements each relate to **one** specific controlling provision, the particular manner schedule should be formatted using the following alternative formula.

"The following measures must be taken to avoid significant impacts on:

- Controlling Provision 1 (e.g. sections 18 and 18A, Listed Threatened Species and Communities)
  - A, B, C Requirements...
- Controlling Provision 2 (e.g. sections 20 and 20A, Listed Ecological Communities)
  - X, Y, Z Requirements..."

Varying NCA-PM decisions

It is difficult to change the requirements of particular manner decisions. To change a requirement, the entire NCA-PM decision must be reconsidered under s 78 of the EPBC Act. For this reason, it is important that the right decision is made in the first instance.

Please consult the Legislation Policy Section if you require further guidance in relation to the application of this guidance note.

Glossary

Action

A project, development, undertaking, activity, or series of activities or a change to any of these (see section 523 of the EPBC Act).

Conditions

Conditions are additional requirements or restrictions that may be placed on a proposed action by the decision-maker after a full assessment as part of an approval under section 133 of the EPBC Act. Conditions can be measures over and above those proposed by the person in their referral and that must be complied with. Conditions can not form part of a NCA-PM decision.

Contingency Plan

A contingency plan provides information about what will happen if the proposed action does not go as expected or has unexpected consequences. This information could also be included in the referral or a project management plan. It is not necessary for a proposed action to have a contingency plan in order to be eligible for a NCA-PM decision.

Controlling provisions

The sections of the EPBC Act that provide the legal basis for controlling actions which might impact protected matters. The controlling provisions are summarised in the table at section 34 of the EPBC Act. These provisions are referenced in the templates for recommendations and decisions under the EPBC Act.

Environmental Offsets

Actions taken outside a development site that compensate for the impacts of that development – including direct, indirect and or consequential impacts. Offsets should not be included in NCA-PM requirements, although they may be an additional, voluntary part of such a proposed action.

For further information see the draft Departmental Policy Statement on *Use of Environmental Offsets under the EPBC Act.*

Mitigation Measures

The range of activities that can be undertaken to reduce the level of impacts of a development. To be included in NCA-PM requirements these measures must protect the environment or prevent detrimental harm to the environment, rather than simply compensate for harm caused. The requirements of a NCA-PM decision must include all necessary mitigation measures.

For further information refer to the draft Departmental Policy Statement on *Use of Environmental Offsets under the EPBC Act.*

NCA-PM Requirements

The key elements of the proposed action listed in the particular manner schedule (see Attachment 1). The requirements describe the "manner" in which the proposed action must be taken. They outline critical elements of the proposed action that provide the decision-maker with an assurance that the proposed action is not likely to have a significant impact on a protected matter if it is taken in this particular way.

Particular Manner (NCA-PM) Schedule

The particular manner schedule is a list of the critical requirements that describe the way in which the proposed action must be taken by the person. This schedule is located at the end of the decision instrument under the heading "manner in which proposed action must be taken" (see the sample NCA PM decision).

Project Management Plan (PMP)

A PMP sets out the detailed information about the way the action will be taken. This information may also be provided in the referral. It is not necessary for a proposed action to have a PMP in order to be eligible for NCA-PM Decision.

Protected matter

The matter of protected under Part 3 of the EPBC Act. For example, the EPBC Act protects the world heritage values of world heritage places (not the geographic footprint). The matters protected by the EPBC Act are summarised in the table at section 34 of the Act.

Referral documentation

In this guidance note referral documentation is used to describe all the information which is provided by the referring party prior to the decision under section 75. It will include information in the referral itself as well as information provided in response to a formal request under section 76 or information

provided through discussions with the referring party.

Referring Party

Throughout this note the 'referring party' is the person who makes the referral. There is no proponent in this note because a proponent is not designated unless and until the decision-maker decides that the proposed action is a controlled action. In addition it should be noted that a NCA-PM decision attaches to the proposed action rather than any particular person.

Section 75

This is the provision of the EPBC Act which requires the Decision-maker to decide whether or not a proposed action is a controlled action.

Section 77A

This is the section of the EPBC Act which requires the decision-maker to make a NCA-PM decision where he or she believes that the proposed action is not a controlled action because it will be taken in a particular manner.

s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Thursday, 1 April 2010 11:00 AM
To: s. 22(1)(a)(ii)
Cc: s. 22(1)(a)(ii)
Subject: FW: Proposed conditions EPBC 2010/5343 [SEC=UNCLASSIFIED]

Importance: High

Categories: UNCLASSIFIED

Hi s. 22(1)(a)(ii) and s. 22(1)(a)(ii)

As discussed, here are some words that cover our compliance view based on the particular manner elements in your draft NCAPM decision for Arrow energy.

s. 22(1)(a)(ii) is going to give you a hard copy of his particular comments.

Cheers, s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Wednesday, 24 March 2010 14:37
To: s. 22(1)(a)(ii)
Cc: s. 22(1)(a)(ii)
Subject: Proposed conditions EPBC 2010/5343 [SEC=UNCLASSIFIED]

s. 22(1)(a)(ii)

As discussed my comments on the proposed NCAPM decision for Arrow Energy is as follows.

I have read the referral and associated documents and the Departments Guidance Note relating to Particular manner Decisions. The conditions imposed are not in the spirit of the Departments Guidance note and have the potential to compromise any prospective action against the proponent. With this in mind if there was a breach of the proposed "conditions" I would not be confident in progressing this matter through the courts.

I have examined the substantive documentation that accompanied the referral. I am of the opinion that their Environmental management SOP's and other included documents are comprehensive enough to cover off on a NCA PM type of project.

Regards

s. 22(1)(a)(ii)
Assistant Director, Compliance 1 (Qld, NT, Vic, Tas)
Department of Environment, Water, Heritage and the Arts
www.environment.gov.au
s. 22(1)(a)(ii)@environment.gov.au
Ph s. 22(1)(a)(ii) Mobile s. 22(1)(a)(ii)
GPO Box 787, Canberra ACT 2601

s. 22(1)(a)(ii)

From: s. 47F(1) @arrowenergy.com.au]
Sent: Wednesday, 31 March 2010 3:30 PM
To: Barker, James; s. 22(1)(a)(ii)
Cc: s. 47F(1)
Subject: FW: EPBC comments from Barton
Importance: High
Attachments: Decision notice- NCA-PM_v0-2_bn.doc

James s. 22(1)(a)(ii)

Further to our discussion on Tuesday 30 March 2010, please find attached a copy of Arrow Energy's comments on the Draft Decision Notice for the Dalby Expansion Project. Our track changes are targeted at value adding and to provide clarity in the application of the conditions as to the manner in which the activities must be conducted.

I apologise for the delay in getting these comments back to you.

I will be contactable on s. 47F(1) should you wish to discuss our comments.

Regards,

s. 47F(1)

s. 22(1)(a)(ii)

From: s. 47F(1) @arrowenergy.com.au]
Sent: Wednesday, 31 March 2010 3:30 PM
To: Barker, Jamess. 22(1)(a)(ii)
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Regards,

s. 47F(1)

Australian Government
Department of the Environment, Water, Heritage and the Arts

Notification of REFERRAL DECISION – not controlled action if undertaken in a particular manner

Dalby Expansion Project (EPBC 2010/5343)

This decision is made under sections 75 and 77A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action	
person named in the referral	Arrow Energy
proposed action	To increase the production capacity of the Surat Basin operations through the initial development of gas fields and expansion of existing gas fields near Dalby, Queensland and as described in the referral received under the EPBC Act on 2 February 2010.

Referral decision: Not a controlled action if undertaken in a particular manner	
status of proposed action	The proposed action is not a controlled action provided it is undertaken in the manner set out in this decision.

Person authorised to make decision	
Name and position	Mary Colreavy Assistant Secretary Environment Assessment Branch
signature	
date of decision	

manner in which proposed action must be taken

The following measures must be taken to avoid significant impacts on listed threatened species and communities (sections 18 & 18A).

- Prior to any vegetation disturbance pre-clearance surveys must be conducted in areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are present or likely or possible to occur. These field validation surveys incorporating observations and verification of base mapping information and key assumptions must be undertaken by a suitably qualified person. If the surveys cannot be conducted at optimum times for the relevant EPBC-listed species, their presence should be assumed and avoidance and minimisation measures implemented. A record of the survey and results must be kept and submitted to the Department on request.

- In areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are likely to be impacted by the proposed action, the person taking the action

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must implement avoidance measures so as to have no significant impact on those species or communities. Demonstration of the avoidance measures undertaken must be provided to the Department on request.

- In areas where impacts to EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species cannot be avoided, the person taking the action must minimise potential impacts by implementing Arrow Energy's Environmental Management Standard Operating Procedures as provided in the referral submitted on 2 February 2010 or subsequent versions that incorporate but do not reduce or remove the environmental management procedures set out in that version of the documents, for: vegetation and habitat; site disturbance; ground disturbance and erosion; weed and pathogen; and rehabilitation. Demonstration of minimisation measures must be provided to the Department on request.

s. 22(1)(a)(ii)

From: Barker, James
Sent: Tuesday, 23 March 2010 4:37 PM
To: s. 47F(1)
Cc: s. 22(1)(a)(ii) s. 47F(1)
Subject: RE: Dalby Expansion Project [SEC=UNCLASSIFIED]
Categories: UNCLASSIFIED
Attachments: Decision notice- NCA-PM.doc

Hi s. 47F(1)

As discussed yesterday and just now, having regard to the conditions which are already covered in the draft State Environmental Authority, I've enclosed a draft of a possible 'not controlled action - particular manner' decision under the EPBC Act. I note that this is a first draft which we have also given to our internal audit area, who may come back to me with comments requiring changes. However, I'd be grateful for any initial comments which you might have on this. If we further revise this following any comments from our audit area, I'll also send you that revised draft for comment, before we put this to the decision-maker.

Regards
James

From: s. 47F(1) @arrowenergy.com.au]
Sent: Friday, 19 March 2010 2:53 PM
To: s. 22(1)(a)(ii) Barker, James
Cc: s. 47F(1)
Subject: Dalby Expansion Project

James, s. 22(1)(a)(ii)

Further to our discussions on Wednesday 17 March 2010, please find attached an exert from current (Friday 19 March 2010) Draft Environmental Authority Conditions for Dalby Expansion Project being negotiated between Arrow Energy and the Queensland Department of Environment and Resource Management. We have provided the conditions that primarily relate to Land, Vegetation and Fauna (not including rehabilitation), for your consideration and discussion.

Arrow would like to work with DEWHA to ensure that we have sufficient management commitments and procedures to ensure MNES issues are managed to the satisfaction of DEWHA in relation to the Dalby Expansion Project.

If it would be of benefit, Arrow would appreciate a teleconference early next week to discuss your requirements further.

Please call me on s. 47F(1) if you would like to discuss further.

Regards,

s. 47F(1)

Australian Government

Department of the Environment, Water, Heritage and the Arts

Notification of REFERRAL DECISION – not controlled action if undertaken in a particular manner

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Referral decision: Not a controlled action if undertaken in a particular manner	
status of proposed action	The proposed action is not a controlled action provided it is undertaken in the manner set out in this decision.

Person authorised to make decision	
Name and position	Mary Colreavy Assistant Secretary Environment Assessment Branch
signature	
date of decision	
manner in which proposed action must be taken	The following measures must be taken to avoid significant impacts on listed threatened species and communities (sections 18 & 18A). • Prior to any vegetation disturbance pre-clearance surveys must be conducted in areas which have the potential to contain EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species. This survey must be undertaken by a suitably qualified person and at optimum times for the relevant EPBC-listed species. A record of the survey and results must be kept and submitted to the Department on request. • In areas where EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species are likely to be impacted by the proposed action, the person taking the action must implement avoidance measures so as to have no significant impact on those species or communities. Demonstration of the avoidance measures undertaken must be provided to the Department on request.

- In areas where impacts to EPBC-listed ecological communities and/or habitat for EPBC-listed threatened species cannot be avoided, the person taking the action must minimise potential impacts by implementing Arrow Energy's Environmental Management Standard Operating Procedures as provided in the referral submitted on 2 February 2010 for: vegetation and habitat; site disturbance; ground disturbance and erosion; weed and pathogen; and rehabilitation. Demonstration of minimisation measures must be provided to the Department on request.

s. 22(1)(a)(ii)

From: Barker, James
Sent: Friday, 19 March 2010 4:43 PM
To: s. 22(1)(a)(ii)
Subject: FW: Dalby Expansion Project [SEC=UNCLASSIFIED]
Categories: UNCLASSIFIED
Attachments: Exert from EA draft conditions 190310.doc

Neisha - can we have a chat early next week re this one?
thanks

From: s. 47F(1) @arrowenergy.com.au]
Sent: Friday, 19 March 2010 2:53 PM
To: s. 22(1)(a)(ii) Barker, James
Cc: s. 47F(1)
Subject: Dalby Expansion Project

James, s. 22(1)(a)(ii)

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Please call me on s. 47F(1) if you would like to discuss further.

Regards,

s. 47F(1)