

Arrow Bowen Pipeline Project

EPBC referral – preliminary documentation

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1 Introduction

This report addresses RFIs raised by DSEWPaC in relation to Matters of National Environmental Significance associated with the construction and operation of a natural gas pipeline. A description of the project is presented below (refer Section 1.1).

This report updates previous submissions including the original submission to DSEWPaC, response to RFI issued by DSEWPaC, and other referral submissions, documents and presentations. Previous submissions and document history are presented in Section 1.2. This report is compiled from ongoing assessment of the alignment including: the most recent surveys, field works and stakeholder consultation and takes precedence over previous submissions. Changes and adjustments to the route are undertaken in consideration of risk mitigation and avoidance of impact to MNES. In the event of any discrepancies between this report and previous submissions the information in this report prevails.

An amendment of the application is included in this submission documentation.

1.1 Overview of the project

Arrow Bowen Pipeline Pty Ltd (Arrow) is the proponent for the Arrow Bowen Pipeline project (the Project). Arrow is a subsidiary of Arrow Energy Pty Ltd (Arrow Energy), a wholly owned subsidiary of Arrow Energy Holdings Pty Ltd (the Parent Company).

The proposed action involves the construction of a buried high pressure coal seam gas (CSG) pipeline of up to 42 inches (1,050 mm) in nominal diameter. Arrow has undertaken ongoing assessment of the alignment based on stakeholder feedback and further field surveys. As such, the route described in the original Referral Documentation and the subsequent amended alignment assessed in the ABP Environmental Impact Assessment (EIS) Supplementary Report (SR)) has been further refined. ABP revision H1 is presented in this report. The total length of the pipeline is approximately 580 km including the Arrow Bowen mainline and two laterals, the Saraji Lateral and Dysart Lateral. The project also includes above ground facilities, pipeline lay down areas, and temporary support facilities associated with the construction or operation of the pipeline. It does not include temporary workers' accommodation camps.

The project will deliver coal seam gas (CSG) from Arrow Energy's gas fields in the Bowen Basin to a proposed Arrow Energy Gladstone Gas Hub in the Aldoga precinct of the

Gladstone State Development Area for further transmission to Arrow Energy's proposed Arrow liquefied natural gas (LNG) Plant on Curtis Island. An overview of the project is shown in **Figure A-1** in **Appendix 1**.

1.2 Referral and submissions to Commonwealth

Arrow referred the Project to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) pursuant to the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) in July 2012 (EPBC Referral Number: 2012/6459).

DSEWPaC requested further information from Arrow on 2 August 2012. Arrow subsequently provided information in a response to the request with regard to the significance of impacts on Matters of National Environmental Significance (MNES).

DSEWPaC made a decision that the Arrow Bowen Pipeline is a controlled action under Sections 75 and 87 of the EPBC Act on 1 November 2012 (**Appendix 2**). The Notification of Decision identified that the Project will require assessment and approval under the EPBC Act before it can proceed. Arrow provided further supporting information on 4 March 2013 and Preliminary Documentation on 10 July 2013 in response to a request for further information issued by DSEWPaC on 22 March 2013.

This revised Preliminary Documentation addresses impacts from the project on the controlling provision controlling provision for the project – listed threatened species and communities for the revised ABP revised ABP Revision H1 alignment.

Table 1-1 further responds to a request for further information, issued by DSEWPaC on 22 July 2013, to provide the Minister with sufficient information to make an informed decision on whether or not to approve the taking of the action under Part 9 of the EPBC Act.

Table 1-1: Arrow’s response to DSEWPaC RFI July 2013

Arrow Bowen Pipeline project Preliminary Documentation (July 2013) (EPBC 2012/6459)	
<p>Document: Arrow Bowen Pipeline project – EPBC referral – supporting documentation (June 2013)</p> <p>Date of Review: July 2013</p> <p>Reviewer: Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC).</p> <p>These comments have been provided to ensure the Minister has enough information to make an informed decision on whether or not to approve the taking of the action under Part 9 of the EPBC Act.</p>	
DSEWPaC Comments on Preliminary Documentation (July 2013)	Arrow response
<p>Temporary workers accommodation camps</p> <p>The original referral documentation states that the Project includes temporary workers accommodation camps. DSEWPaC notes that Arrow does not intend for the proposed action to include temporary workers accommodation camps and has requested that construction camps are not included within the scope of the action. To account for this, and any changes to the pipeline route since the referral, DSEWPaC recommends that Arrow submit a request to vary the project under the EPBC Act.</p> <p>The proponent may request that the decision maker agree to accept a variation to a proposal being assessed under the EPBC Act. The request must be made in writing (hard copy or email) and contain the following information:</p> <ul style="list-style-type: none"> ▪ the details of the proposed variation; ▪ the reasons for the variation; ▪ a comparison of the impact on matters of national environmental significance between the original proposal and 	<p>Arrow submits a request to vary the proposal to remove temporary construction camps from the action.</p> <p>Temporary construction camps are not part of the approval applications lodged by Arrow Energy, including applications under Part 9 of the EPBC Act.</p> <p>Applications for temporary construction camps will be made under a separate process. In the event that these camps will affect MNES an independent referral to DSEWPaC will be lodged.</p> <p>Arrow has undertaken route refinements since the initial submissions to DSEWPaC. These refinements are based on:</p> <ul style="list-style-type: none"> • Environmental and Engineering surveys into the route and avoidance of environmental sensitivity and/or constructability constraints. • Cultural Heritage considerations and constraints • Land owner and stakeholder consultation • Government consultation (e.g. use of State Development Corridors) • Changing Project requirements

<p>the variation;</p> <ul style="list-style-type: none"> ▪ any impacts on matters of national environmental significance that were not included in the original proposal; and ▪ any alternatives, mitigation measures or offsets to compensate for additional impacts (if any). <p>The character of the varied proposal must be substantially the same as the character of the original proposal.</p> <p>When a variation is accepted it effectively replaces the original proposal. Anything that has already been done on the original proposal is taken to have been done on the variation.</p> <p>Please note that the Minister (or his delegate) has 20 business days to decide whether to accept a variation.</p> <p>DSEWPaC notes that a change in pipeline route has reduced impacts to MNES, and is supportive of this. DSEWPaC also notes that Arrow will refer temporary workers accommodation camps for consideration under the EPBC Act at a later date should these camps impact on MNES.</p>	
<p>Translocation</p> <p>Please note that DSEWPaC does not generally accept translocation of species as an effective mitigation measure unless it can be clearly demonstrated based on scientific evidence to be effective for an individual species.</p>	<p>Arrow notes the concerns identified by DSEWPaC regarding translocation. The use of translocation for King Blue Grass is directly identified by Vallee et al. 2004 and was used in this context.</p> <p>References to translocation of individuals refer to the recovery of these individuals from potential harm (such as trenchfall) and release in the same area.</p> <p>References to relocation of a colony (as in the case of the species dossier for the Yakka Skink) refer to the removal of the colony from the ROW and re-establishment adjacent to the ROW. In the case of a colony this would be undertaken only in the event that avoidance of disturbance was not possible.</p>
<p>Disturbance</p> <p>DSEWPaC notes that as a result of route revision, the Natural Grasslands of</p>	<p>Arrow anticipates avoidance of Natural Grasslands, however the current route may disturb some areas of Natural Grassland. Arrow has reconsidered</p>

<p>the Queensland Central Highlands and the Northern Fitzroy Basin can be avoided. DSEWPaC anticipates that, should the project be approved, it is likely that conditions of approval would reflect a zero disturbance limit on species and communities that are identified as not being impacted.</p>	<p>the species dossier and has resubmitted this dossier to update the pipeline route information and potential disturbance.</p>
<p>Surveys</p> <p>Thank you for providing more detail around surveys undertaken for listed threatened species and communities. Please also briefly discuss how these surveys are consistent with DSEWPaC survey guidelines for relevant listed threatened species and communities (noting that the survey guidelines for Yellow Chat have already been discussed in detail).</p> <p>DSEWPaC expects pre-clearance surveys to be undertaken in accordance with relevant DSEWPaC survey guidelines (where they exist).</p>	<p>Arrow has undertaken searches for MNES species as part of ecological baseline studies. These studies will be ongoing throughout the life of the project.</p> <p>Whilst Arrow acknowledges and follows the guidelines there can be constraints regarding why a particular survey may vary from a guideline, including, for example stress of weather (flooding preventing access to sites), inability to gain access to land to conduct a survey or survey area involved may reduce the time available within any particular survey.</p> <p>Arrow notes that while guidelines provide guidance to survey method and effort, minor deviations from the guideline do not necessarily invalidate results obtained from the survey.</p>
<p>Critical habitat</p> <p>Please note that habitat critical to the survival of a species is not just restricted to habitat identified in the Register of Critical habitat under the EPBC Act or referral guidelines. The definition of critical habitat in the Significant Impact Guidelines should be used – this includes areas that are necessary for activities such as foraging, breeding, roosting or dispersal, for the long-term maintenance of the species, to maintain genetic diversity or for the reintroduction of populations or recovery of the species.</p>	<p>Arrow has applied the critical habitat in the Significant Impact Guidelines consistently throughout the species dossiers (e.g. Koala, Yellow Chat and Water Mouse).</p>
<p>Rehabilitation</p> <p>Thank you for providing more detail around rehabilitation. Please note that where rehabilitation for a listed threatened species or community is unsuccessful, and has been relied upon to reduce the level of impact, offsets may be required.</p> <p>It is unclear how rehabilitation will benefit the Koala when the species relies</p>	<p>Arrow accepts the use of offsets where rehabilitation may be unsuccessful.</p> <p>Arrow notes that the identification of Koala habitat included areas potential occupancy and was not necessarily core habitat. Additionally, preclearing surveys will identify trees that should be retained within the ROW (for example some large hollow bearing trees) and these trees would be trimmed or excluded from clearing.</p>

<p>on large established trees, and rehabilitation (at least in the short term) will target natural grass species. Any impact to Koala habitat from clearing is likely to be long term.</p>	<p>Rehabilitation of the ROW is not based on native grasses but is cognisant of the surrounding RE, habitat and land use. Arrow proposes to rehabilitate the majority of the ROW, leaving a seven metre strip, centred over the pipeline, for access and maintenance of the ROW.</p> <p>Whilst the Koala prefers trees >30 cm these trees will develop in the short to medium term. Additionally, the disturbance is narrow and suitable trees will be present adjacent to the ROW. Arrow does not accept that there will be a long term impact to Koala from clearing for pipeline construction.</p>
<p>Yellow Chat</p> <p>DSEWPaC notes that some sections of the species dossier for the Yellow Chat have been contributed to by Wayne Houston from Central Queensland University. Can you please confirm whether Mr Houston has also contributed to the assessment of impacts and mitigation measures proposed for the species.</p> <p>Based on discussions with Arrow, DSEWPaC was of the view that Capricorn Conservation Council was consulted in preparing a specific species management plan for the Yellow Chat. Can you please provide more information on consultation regarding impacts and mitigation measures for the Yellow Chat. DSEWPaC has not seen a Yellow Chat Management Plan – please clarify if this will be provided with the preliminary documentation.</p>	<p>Mr Houston’s area of expertise is the ecology of the Yellow Chat. The information he provided established the baseline principles and underlying ecology associated with the potential impact on and mitigation of risk to the Yellow Chat. His data, related to the population and distribution of the species, were directly used (and referenced within the relevant dossier). In this regard his expertise was used within his professional field, and Arrow is considering a research proposal to support Mr Houston’s ongoing research into this species.</p> <p>Arrow is conscious that consultants and contributors may incur professional liability should they be required to contribute beyond their identified skills and expertise. In this regard Mr Houston’s contribution was within his area of expertise.</p> <p>Arrow asserts that the selection and use of consultants should not be a matter for comment by any other party, particularly where application of the commentary may increase a consultant’s exposure to professional liability.</p>
<p>Offsets</p> <p>DSEWPaC notes that offsets are proposed for some species and communities in the event that they cannot be avoided (e.g. Black Ironbox, Weeping Myall). This is consistent with DSEWPaC’s view that offsets may be required for species or populations (particularly breeding populations) found during pre-clearance surveys (e.g. Yakka Skink, Dunmall’s Snake, Squatter Pigeon, Grey-headed Flying Fox) where impacts cannot be</p>	<p>Arrow notes that species such as Yakka Skink, Dunmall’s Snake, and Squatter Pigeon may occur across a broad range of habitats, including, for example, cleared grazing paddock with introduced pasture, or in the case of Dunmall’s Snake all woodland or open forest within the ROW. The inclusion of potential habitat, where a species “may occur” within the description of habitat has increased the reported areas of clearing.</p>

adequately addressed through avoidance, mitigation and management measures.

A large amount of habitat will be cleared for some listed threatened species (e.g. Yakka Skink, Dunmall's Snake, Squatter Pigeon and Koala).

DSEWPaC is of the view that offsets should be proposed for residual significant impacts to the Koala. Offsets must comply with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (October 2012) and accompanying Offsets assessment guide, accessible from: www.environment.gov.au/epbc/publications/environmental-offsets-policy.html. DSEWPaC may require offsets for other listed threatened species and communities, in accordance with the EPBC Act offsets policy.

In the case of Dunmall's Snake no clearing will occur on critical or essential habitat and 218.12 Ha of potential habitat will be cleared. Within a 5 km buffer of the pipeline ROW there is a total of 128313.05 Ha of potential habitat. Consequently, 0.17% of the maximum reported habitat where the species may occur may be cleared for construction of the pipeline. This ratio (between potential habitat within the ROW and the Buffer) is similar for the Yakka Skink.

With respect to Koala, Arrow notes that the estimates of clearing included secondary habitat where this species may occupy. Arrow has committed to cross the lower Isaac River via trenchless technology to avoid disturbance to riparian *Eucalyptus tereticornis* which provides critical habitat for koala.

Arrow accepts the requirement to rehabilitate disturbed environments and to provide offsets for areas that are unable to be rehabilitated.

The use of potential habitat represents the worst case clearing requirements for any particular species.

Arrow has identified matters arising from DSEWPaC review of the Preliminary Documentation version 1.1 (dated 22 March 2013) through use of information boxes to identify the RFI, Comments and Response.

Request for additional information	DSEWPaC Comments	Arrow Response
<p>Preliminary documentation should be bound in a single volume and must be accompanied by an index identifying what documents are included. Information must be presented using language that is intelligible to the general reader, and accompanied by maps, figures, tables, etc where appropriate.</p>	<p>Thank you for presenting the Preliminary Documentation as a single volume in a clear and easy to read format. As discussed, any reference to the EIS document provided for State assessment purposes must be provided as a hyperlink in the Preliminary Documentation to a specific part of that EIS to ensure a transparent assessment of impacts that is easily accessed and available to the public.</p> <p>Only supporting documentation (e.g. detailed survey effort information) should be cross-referenced. A summary of this information, including rationale and evidence to support conclusions, must be provided in the Preliminary Documentation so a standalone assessment of impacts is presented.</p>	<p>Arrow has issued this updated Preliminary Documentation and species-specific dossiers in response to this request.</p> <p>Including a request for variation to ensure that the current project description is reflected in the documentation.</p>

2 Detailed description of proposed action

2.1 Description of proposed action

2.1.1 Pipeline route

A map of the proposed route is presented in **Figure A-1, Appendix 1**.

The project will originate approximately 18 km NW of Glenden (90 km north of Moranbah) in Central Queensland and terminate at the proposed Arrow Energy GGH approximately 22 km west of Gladstone where it will join the Arrow Surat Pipeline (ASP), formerly known as the Surat Gladstone Pipeline Project (SGP), for further transmission to the proposed Arrow LNG Plant on Curtis Island.

From the origin, the proposed pipeline route traverses the flat floodplain areas of the Isaac River before crossing the Broadsound Range where it follows the Marlborough Creek from the vicinity of Develin to Midgee, south of Rockhampton. The two lateral lines associated with the Project are located in this section of the route:

- Saraji Lateral approximately 26 km in length from a point about 11 km east of Peak Downs Mine to the mainline about 35 km east of Peak Downs Mine
- Dysart Lateral approximately 25 km in length from a point about 15 km west of Dysart to the mainline about 43 km east of Dysart

The proposed pipeline route enters the Stanwell Gladstone Infrastructure Corridor State Development Area (SGIC SDA), declared by the Queensland Government for linear infrastructure, between Stanwell and Mount Larcom. The route then enters a second declared State Development Area, the Gladstone State Development Area (GSDA) and remains within this corridor to the Gladstone Gas Hub (GGH) in the Aldoga precinct. At the GGH the pipeline will join with the proposed Arrow Surat Pipeline.

The proposed pipeline route traverses a number of petroleum production and exploration tenements within the Bowen Basin and is centrally located to Arrow's CSG reserves. The majority of land traversed by the proposed pipeline route is rural, much of which has been cleared for agricultural purposes, particularly grazing and cropping. The countryside is generally flat or undulating, crossed by waterways and marked occasionally by mountain ranges, hills, rocky outcrops, gullies and steep slopes.

2.1.2 Local government areas

The proposed pipeline route will commence in the southern part of the Whitsunday Regional Council Local Government Area (LGA), traverse the Isaac and Rockhampton Regional Council's LGAs in a southerly direction and terminate in the Gladstone Regional Council LGA. The proposed pipeline route also traverses land included within two State Development Areas (SDAs), being the SGICSDA and the GSDA.

The route through Local Government Areas is shown on **Figure A-1, Appendix 1**.

2.1.3 Matters of national environmental significance

The location of MNES potentially affected by the project, including listed threatened species and ecological communities, is described in this document in accordance with route identifiers:

- For the Arrow Bowen mainline – AB is the prefix for kilometre point; AB0 indicating the most northern point (near Moranbah) and AB 483 indicating the most southern point (Termination point at the GGH).
- For the Saraji Lateral (SL) – SL is the prefix for kilometre point; SL0 indicating the most western point and SL25.8 indicating the most eastern point where this lateral joins the ABP mainline.
- For the Dysart Lateral (DL) – DL is the prefix for kilometre point; DL0 indicating the most western point and DL24.6 indicating the most eastern point where this joins the ABP mainline.

2.1.4 Key characteristics of the project

The Project will have the following characteristics:

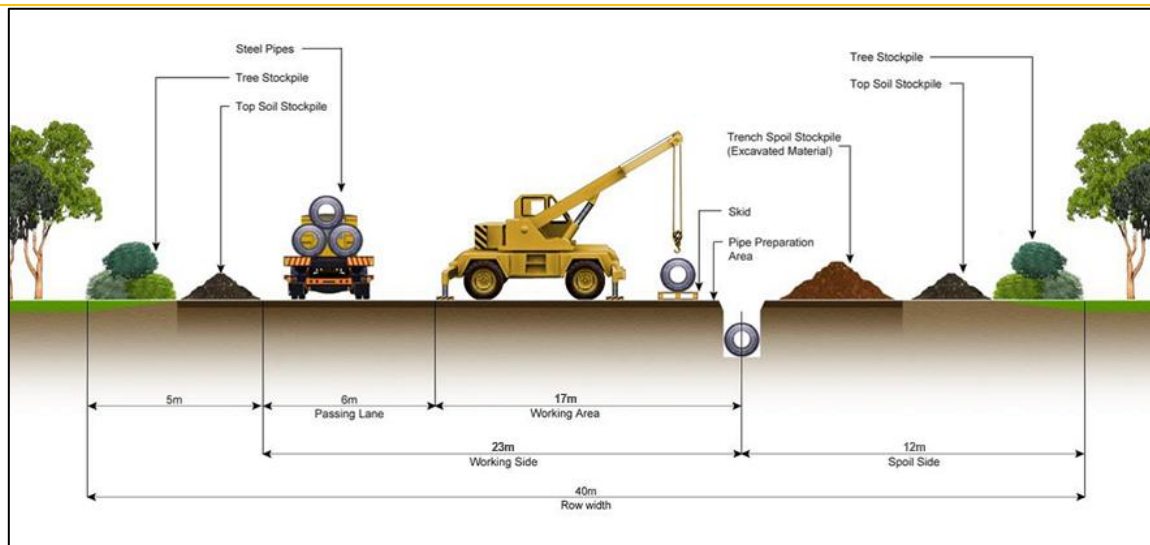
- The pipeline will be a buried, high pressure, steel, natural gas pipeline, with a nominal diameter of up to 42 inch (DN1050) for the mainline and up to 20 inch (DN500) for the lateral pipelines (SL and DL) including some 16 inch (DN400) buried steel pipeline.
- The pipeline will be integrity tested by 100% examination of welds and a high pressure hydrostatic test at pressures in excess of the Maximum Allowable Operating Pressure (MAOP).
- The pipeline will be buried with a minimum depth of cover of 750 mm. At watercourse crossings, the minimum depth of cover will be increased to at least 1,200 mm.
- The pipeline trench will be approximately 2 metres deep and 1.5 metres wide.

- A connection to a proposed gas hub (GGH) near the Bruce Highway, approximately 22 km southwest of Gladstone.
- Construction of the pipeline will directly affect a maximum area of approximately 2136 Ha and will be constructed within a 40 metre construction Right of Way (ROW). The operational easement will be 40 metres.
- The project will have a minimum technical design life of 40 years, however, with ongoing integrity management the operational life is expected to be in excess of this figure.
- The proposed pipeline will be typical of a modern, large diameter gas transmission pipeline and will be designed, constructed and operated in accordance with the Australian Standard (AS) 2885 series and the *Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines* (APIA, 2009).
- Above ground facilities to be established at intervals along the proposed pipeline route include mainline valves, scraper stations, cathodic protection systems and marker signs.

2.1.5 Pipeline construction

It is envisaged that the pipeline will be constructed over 18 months, commencing in April 2016. It is proposed to award the contract for the pipeline construction in 2014/2015. The contractor will have the responsibility for development of a detailed construction schedule that meets the completion deadline.

Construction will require a ROW along the proposed pipeline route with a width of 40 metres. The ROW is essential to provide access along the proposed pipeline route for pipe, personnel and supplies during the construction works (**Figure 2-1**). Additional areas will be required for access tracks, truck turnarounds, pipe and equipment laydown areas and temporary workers' accommodation camps.



Source: Queensland Curtis LNG Project EIS (QGC Limited, 2009) –amended

Figure 2-1: Indicative corridor layout for pipeline construction –

The pipeline will comprise of coated steel pipe lengths welded together. Construction will be typical of modern pipeline projects and will involve the following key steps:

- Establishment of temporary facilities such as work areas for equipment and pipe storage, and access tracks
- Surveying and pegging the pipe centreline
- Installation of temporary gates and fences, as required
- Clearing vegetation and grading the ROW to prepare a safe construction working area. The areas affected will be reduced by using pre-existing clearings and reducing clearing widths in endangered communities
- Separating and stockpiling topsoil and subsoil for reuse during rehabilitation
- Welding the pipe sections together to form ‘strings’ approximately 800 metres in length
- Excavating a trench approximately 2 metres deep and 1.5 metres wide to accommodate the pipe. The depth of cover will be determined through use of a risk assessment in accordance with AS2885. A qualified and experienced fauna spotter / handler will check the trench for captured fauna at least daily, preferably in the morning to remove animals prior to the heat of the day
- Lowering the pipeline string into the trench on top of padding (fine sub-soil) at the base to protect the pipe coating from damage
- Returning the subsoil and topsoil to their original horizons
- Testing the integrity of the pipeline by filling it with water and pressurising (hydrostatic pressure testing) it to above the maximum allowable operating pressure
- Cleaning up, restoring and rehabilitating the ROW and access tracks.

Clean up, restoration and rehabilitation measures will be applied to the additional areas including access tracks, truck turnarounds, pipe and equipment laydown areas, as soon as practical after the ROW construction activities in the area have been completed.

Rehabilitation will be undertaken in accordance with best practice and aim to create stable landforms, reinstate natural drainage patterns and return the land to pre-construction productivity. Rehabilitation of ecological communities disturbed by the project will provide for restoration of the structural characteristics of the ecosystem. Deep rooted species will be included in the rehabilitation where their use will not affect the safety and integrity of the pipeline.

2.1.6 Workforce and temporary workers accommodation camps

The project is anticipated to require a workforce of 693 during construction, 10 during commissioning, 15 during operation and 10 during decommissioning.

Temporary workers' accommodation camps are not associated with this proposed action. A separate application for temporary workers accommodation camps will be made as necessary.

Request for additional information	DSEWPaC Comments	Arrow Response
General Comments	The Preliminary Documentation states that a separate application for temporary workers accommodation camps will be made as necessary. DSEWPaC notes that temporary workers accommodation camps were included within the original referral documentation, and as these camps would be part of the larger Bowen Pipeline project must be considered and assessed as part of this referral. Please provide more information concerning impacts to listed threatened species and communities from temporary workers accommodation camps (noting that the referral documentation states that these camps are expected to result in 125 hectares of disturbance).	As indicated in Table 1-1 (above) Arrow is seeking an amendment to remove construction camps from the Project description.

2.1.7 Commissioning

Following completion of hydrostatic pressure testing, each section of the pipeline will be commissioned. Commissioning activities will be in accordance with a procedure prepared during the detailed design and construction phase of the project. This will involve a staged process as follows:

- Initial injection of an inert gas (e.g. nitrogen) to prevent mixing of CSG with the air in the pipeline
- Low pressure CSG fill
- Final high pressure fill to limit gas availability
- Commissioning checks and performance tests.

The initial CSG fill will be preceded by the introduction of a slug of an inert gas, typically nitrogen, and a number of foam pigs to separate the air present in the pipeline after construction and the CSG, to mitigate the risk of an explosion due to any air / gas mixture.

During purging, air will be discharged from the downstream end of the section being commissioned (typically at a line valve) followed by the nitrogen slug and then CSG. As there may be some mixing of the slugs, the CSG may initially contain some nitrogen. Venting will continue until pure CSG is detected at the outlet (valve), after which the section will be locked in and the pressure increased until the low level cap is reached.

Some minor discharge of low pressure gas will occur during the commissioning process.

The low-pressure fill enables further integrity testing at low pressures to be undertaken prior to the pipeline reaching full line pressure.

At the completion of commissioning, the pipeline will have been purged and filled with gas to a pressure determined by the Commissioning Manager to be ready for operation.

2.1.8 Operation

The operation of the pipeline will be in accordance with approval documentation, a specific Environmental Management Plan (EMP), AS 2885 and the APIA Code (APIA 2009).

The route will be progressively rehabilitated during the construction period. Shrubs and trees will be encouraged on the margins of the ROW. Deep rooted species which may affect the safety and integrity of the pipeline will not be permitted above the pipeline. A 40 metre operational easement will be retained following construction.

A summary of operational activities is provided in Table 2-1.

Table 2-1: Summary of pipeline operational activities

Activity / issue	Description / management
Weed control	Localised weed spraying (in consultation with landholders) undertaken along the easement as required (primarily in the first 12 months following commissioning) will form a key part of ongoing maintenance of the project site.
Line of sight clearance	To maintain line of sight, clearance of the pipeline easement, within three metres of the proposed pipeline centerline, will be required. Regeneration of shrubs and trees elsewhere on the easement will be encouraged elsewhere within the ROW except where deep rooted species may affect pipeline integrity.
Aerial inspection of easement	Inspections may be undertaken using rotary or fixed-wing aircraft, particularly in areas where only limited public road access is available. The frequency of these inspections will vary depending upon the particular issue being inspected, but is typically monthly or quarterly.
Patrolling / inspections easement access	This will be undertaken, in conjunction with aerial inspections, by travelling along the project site in vehicles on an as-needed basis. This will involve access to private property and use of private access tracks.
Pipeline operations	
Cathodic protection surveys	Surveys will be undertaken at selected points along the pipeline to test and maintain the effectiveness of the cathodic protection system. These surveys are typically conducted on an annual basis. Depending upon the results detected, repairs to the pipe coating or the cathodic protection system may be required.

Activity / issue	Description / management
Testing and inspection valves	Valve testing will be operated to ensure their availability in the event of an emergency. The test method is likely to release small volumes of gas from each mainline valve. These tests are expected to be undertaken on an annual basis.
Emissions	Throughout the lifetime of the project, small amounts of gas may be released to the atmosphere under controlled conditions during pipeline and facility maintenance.
Pipeline incident	<p>The main threats to public safety during operation and maintenance are fire, explosion or radiation exposure as a result of pipeline rupture. AS2885 contains a methodology for evaluating pipeline risk. Pipeline risk assessments have identified risk factors and facilitate the development of mitigation measures for reducing key risks.</p> <p>The pipeline will also be constructed and operated according to the Pipeline Protection Safety Measures contained in the approved Safety and Operating Plan and in accordance with an approved Emergency Response Plan.</p>
Pipeline maintenance	
Coating integrity surveys	Immediately after commissioning, and generally in conjunction with the annual cathodic protection surveys referred to above, a coating conductance test (Direct Current Voltage Gradient survey) will be carried out to determine if there are any defects in the external pipe coating that might compromise the continued long term integrity of the pipeline. Where these readings indicate that such defects cannot be controlled by the cathodic protection system, the section will be excavated and the pipeline coating repaired.
Pigging	Pigging is periodically undertaken to assess the continued integrity of the pipeline. An 'intelligent pig' is placed into the pipeline at a launcher station and is propelled through the pipeline by the gas flow before removal at a pipeline receiver station. This pig detects any damage to the pipeline and is used to direct repairs if significant damage is detected. Minor venting of gas to the atmosphere results during pig removal.

Activity / issue	Description / management
Pipeline infrastructure operation and maintenance	
Gas hub	The proposed GGH is where the pipeline will join with the ASP. It will consist of pipeline isolation valves and scraper station plus an interconnector. These operate continuously.
Erosion repair	Any areas of subsidence or erosion detected will be repaired to match existing ground contours.
Weed control	Localised weed spraying is undertaken in and around above ground facilities typically one to two times per year.
Waste disposal	General waste generated during operations is collected on site and removed to licensed facilities for disposal. Other wastes will be removed from the ROW in accordance with waste management protocols (e.g. minimisation and recycling) and legislation (such as regulated waste tracking).

2.1.9 Decommissioning

In the event that the pipeline is no longer required, it will be decommissioned in accordance with legislative and regulatory requirements and accepted environmental best practices and standards applicable and relevant at that time. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant, pipeline valves and metering stations) and the restoration of associated disturbed areas.

At the time of decommissioning, a decision will be made regarding the opportunities for future use of the pipeline. The following two options will be considered:

- Moth-balling – this will involve depressurising the pipeline, capping and filling with an inert gas (such as nitrogen) or water with corrosion inhibiting chemicals. The cathodic protection system will be maintained to prevent the pipe corroding; and
- Abandonment – this could involve purging the pipe of natural gas, disconnecting it from the manifolds and removing all above ground facilities. The pipe will then be filled with water and left to corrode in-situ. Removing the pipe from the ground is unlikely to be an environmentally- or commercially-viable option. A detailed rehabilitation program will be developed and implemented in consultation with landholders and the regulatory agencies at the time of abandonment.

2.2 Alternatives to taking the proposed action

There are a number of potential alternatives associated with the project and selection options, including:

- Development of the Central Queensland Gas Pipeline (CQP)
- No project option
- Alternative pipeline route options
- Changes to project design, construction techniques and environmental impact mitigation measures.

2.2.1 Development of the Central Queensland Gas Pipeline

Arrow Energy is currently a 50/50 joint venture holder with AGL Energy Ltd, the proponent for the proposed Central Queensland Gas Pipeline (CQP) (PPL121). The CQP involves the construction and operation of a 440 km long high pressure gas transmission pipeline from Moranbah to Gladstone in Central Queensland. The CQP is planned to provide a strategic link for gas supply between north Bowen Basin and Gladstone. The CQP crosses a larger number of underlying coal mining tenures and does not have the design capacity to supply gas to the proposed Arrow LNG Plant on Curtis Island together with other potential off-takers in Gladstone. Consequently, the CQP is not considered a suitable alternative to the proposed action.

2.2.2 No project option

The consequences of not proceeding with the project would mean the overall project benefits such as contribution to economic growth and employment would not be realised. This would be to the detriment of the local, regional, state and national economies. Increased competition in the gas supply market would potentially be compromised, increase in Australian exports would likely be delayed or not achieved and the direct economic benefit from construction expenditure and the longer term benefits of the pipeline operation would not be realised.

2.2.3 Alternative pipeline route options

Arrow explored a number of alternative pipeline route options for the supply of CSG from the Bowen Basin to the Arrow LNG Plant on Curtis Island. One of Arrow's objectives for the project, is to cost effectively deliver CSG from Bowen Basin resources to the Arrow LNG Plant at Curtis Island for export to customers.

To deliver on this objective, the proposed pipeline route needs to be:

- Located in a pipeline corridor that allows cost effective construction while minimising impacts to the environment, landholders, local communities and mining interests

- Optimally configured to efficiently accommodate current capacity requirements while allowing for cost effective expansion to meet future capacity requirements
- Designed and constructed in compliance with relevant standards while achieving capital and operating cost efficiencies through innovation in design and construction.

The pipeline route options were based initially on a desktop assessment of topographical and ecological mapping. Each alternative pipeline route commenced in the Bowen Basin, approximately 90 km north of Moranbah and consisted of a number of headers and lateral pipeline options.

The proposed pipeline route incorporates information obtained through engagement with State and Local Governments as well as community consultation and includes occupation of the SGIC and avoidance of the industrial estate near Gracemere.

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

The proposed action does not include alternative timeframes, locations or activities.

2.4 Context, planning framework and State/Local Government requirements

Arrow has an approved Environmental Authority (EA) (PEN205380112) and a Petroleum Survey Licence (PSL) (PSL 82) for the project from the Department of Environment and Heritage Protection (DEHP) and Department of Natural Resources and Mines (DNRM) respectively pursuant to Chapter 4, Part 1 of the Petroleum and Gas (Production and Safety) Act 2004 (P&G Act). PSL 82 provides land access, enabling field assessments to be undertaken for ecological and cultural heritage surveys and engineering and construction inspections, particularly to refine pipeline route selection, within the investigation area for this pipeline. The Public Service Department Arrangements Notice (No1) 2012, identifies changes to these government departments. PSL 82 replaces PSL 73 and expires on 30 January 2014.

Where a petroleum product is transported via a pipeline outside the area of a petroleum lease an application must be made to Minister of the Department of Natural Resources and Mines (DNRM) for the grant of a pipeline licence (PPL). The pipeline will be licensed under the P&G Act. An EA under the *Environment Protection Act 1994* (EP Act) will be required from the Department of Environment and Heritage Protection (DEHP) for a Level 1 Environmentally Relevant Activity (ERA), as defined in Schedule 5, *Environmental*

Protection Regulation 2008, namely “constructing a new pipeline of more than 150 km under a petroleum authority”.

A number of additional approvals will be required following DEHP’s assessment of the Environmental Impact Statement (EIS) and DNRM’s grant of the PPL. These will be obtained at a later date once full details of construction and operation are known. Applications for Development Approvals (DAs) for the temporary workers’ accommodation camps will be made under the IDAS process pursuant to the SP Act.

2.4.1 Commonwealth approvals

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act protects the environment in general, and particularly in relation to matters of National Environmental Significance (MNES). DSEWPaC provided Notification of a Decision that the Arrow Bowen Pipeline is a controlled action under Sections 75 and 87 of the EPBC Act on 1 November 2012. The proposed action is likely to have a significant impact on the following matter protected by the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A).

The Decision (refer Appendix 2) identified that the Project will require assessment and approval under the EPBC Act before it can proceed.

Native Title Act 1993 (NT Act)

Under the NT Act, indigenous land rights may exist in areas such as vacant or unallocated Crown land, some reserve lands, some types of pastoral lease and waters that are not privately owned. Native title can be extinguished by certain actions (for example, where the land is held under freehold title).

The native title process being undertaken for this proposed action involves the development of Indigenous Land Use Agreements (ILUAs) with the registered native title claimants along the route, with these ILUAs to be lodged for registration with the National Native Title Tribunal.

Aboriginal and Torres Strait Island Heritage Protection Act 1984 (ATSIHP Act)

The ATSIHP Act provides Indigenous (Aboriginal and Torres Strait Island) people in any Australian state or territory (with certain caveats pertaining to Victoria) with the right to

request the relevant Commonwealth Minister to intervene in matters where traditional cultural heritage interests are considered to be at risk.

Cultural Heritage Management Plans (CHMPs) will be contained in the relevant ILUAs (currently being prepared by Arrow) or be developed separately for approval by DEHP to satisfactorily address the cultural heritage interest of the relevant Aboriginal Endorsed Parties along the proposed pipeline route. It is considered that the ILUA / CHMP will comply with the ATSIHP Act and the NT Act as well as applicable state government cultural heritage legislation.

2.4.2 State approvals

Petroleum and Gas (Production and Safety) Act 2004 (P&G Act)

Under the P&G Act a point-to-point Petroleum Pipeline Licence (PPL) authorising the construction and operation of the pipeline (including all connected facilities e.g. valve, scraper and meter stations, plant and equipment) will be required from the Minister of DNRM. Similar to a PSL, an EA is required for the project from DEHP before the PPL can be issued.

A PPL exempts some pipeline activities from approval under other Acts, for example vegetation clearing under the *Vegetation Management Act 1999* (VM Act). Exemptions only apply to situations where works are conducted for activities authorised under the PPL and located within the specified PPL tenure.

Environmental Protection Act 1994 (EP Act) and Environmental Protection Regulation 2008 (EP Regulation)

Construction of a new transmission pipeline greater than 150 km is classified as a Level 1 Chapter 5A petroleum activity under the EP Regulation. To undertake a Level 1 petroleum activity (which is also defined as Level 1 Environmentally Relevant Activity (ERA) under the EP Act), an EA must be issued by DEHP.

As mentioned above, an EA must be issued by DEHP before a PPL can be granted. As part of the EA application for this Project, a detailed report and EMP will be developed and submitted. The EMP will outline the general environmental and social aspects of the Project (including associated facilities, temporary worker's accommodation camps etc.) and sets environmental protection commitments for construction and operations.

Environmentally Relevant Activities (ERAs), defined under Schedule 1 of the EP Regulations, are activities with the potential to release contaminants to the environment and cause environmental harm.

It is noted that approval for ERAs is required from DEHP for the temporary workers' accommodation camps (e.g. electricity generation, fuel burning and sewage treatment) will be obtained under the IDAS process pursuant to the Sustainable Planning Act (SP Act). Consequently these facilities do not form part of the pipeline approval process.

State Development and Public Works Organisation Act 1971

The SDPWO Act contains provisions for the state to declare infrastructure corridors to facilitate the development of compatible infrastructure. The proposed pipeline route will occupy corridors established for this purpose in the Gladstone/Rockhampton area.

Water Act 2000 (Water Act)

The Water Act regulates the use, flow and control of water including water in a watercourse, lake or spring, underground water, overland flow water, water that has been collected from a dam and recycled and desalinated water.

Under the Water Act, activities that will involve vegetation destruction, excavation and fill in a watercourse are exempt from assessment under section 49, 50 and 51 of the *Water Regulation 2002* (Water Regulation) as long as they are authorised under a licence, petroleum lease or authority to prospect under the P&G Act. If works are undertaken outside the PPL area, a Riverine Protection Permit (RPP), which will require the written consent of adjacent land owners, will be required under the Water Act to remove vegetation, excavate and fill within the waterways.

A permit is also required to source water from a watercourse, lake, spring or aquifer for an activity of a temporary nature under section 237 of this Act. Water may be temporarily required during construction of the proposed pipeline route for directional drilling, hydrotesting, dust suppression and for potable temporary workers' accommodation camp water. This permit process is separate to the SP Act and is required regardless of the PPL granted under the P&G Act.

Vegetation Management Act 1999 (VM Act)

The VM Act provides for the conservation of native vegetation in Queensland and regulates the clearing of mapped remnant vegetation (termed Regional Ecosystems (RE)) and high value regrowth vegetation on freehold and leasehold land. Approval under VM Act is required if remnant vegetation is to be cleared, with applications for approval likely to be accompanied by a Property Map of Assessable Vegetation (PMAV). An exemption applies where the clearing is for a 'specific activity' listed in Schedule 24 of the SP Regulation, which includes clearing for a EP Act Chapter 5A activity (Part 1, Item 1(6)).

Consequently, vegetation clearing on freehold and leasehold land is exempt from assessment under the VM Act where the construction of the proposed pipeline, including incidental activities, is undertaken within the area covered by the PPL. Clearing related to incidental activities outside the PPL area, such as temporary workers' accommodation camps and borrow pits, which involve vegetation clearing will require development approval.

Nature Conservation Act 1992 (NC Act)

The NC Act has a number of associated regulations, plans and orders to protect Endangered, Vulnerable and Near Threatened (EVNT) species.

The NC Act and regulations state that any person taking, using or interfering with protected EVNT fauna is required to have a Wildlife Rehabilitation Permit (spotter-catcher) and to possess the training and skills required to undertake this activity. Such a permit will allow a person to rescue and release a sick, injured or orphaned protected animal; or a protected animal whose habitat has been, or will be, destroyed by human activity or a natural disaster.

A clearing permit (protected plants) is required when taking, using or interfering with EVNT flora under the NC Act.

Land Act 1994 (Land Act)

The Land Act provides a framework for the allocation of state land as leasehold, freehold or other tenure. Under Chapter 4, Part 4 of the Land Act, a permit to occupy is required from DEHP where the project is developed on a reserve, road or unallocated state land.

Further, a permit is required under section 113 of the Land Act for clearing of vegetation on all state lands. The application must be made to DEHP regardless of whether the clearing will take place within or without the PPL area.

Aboriginal Cultural Heritage Act 2003 (ACH Act)

All objects and areas of Aboriginal cultural heritage significance in Queensland are dealt with under the ACH Act. The ACH Act covers places of archaeological and historical significance.

The ACH Act operates on the basis of a duty of care owed by development proponents and others to Aboriginal cultural heritage.

In this case, it is necessary that a CHMP or native title agreement be prepared in consultation with the relevant Aboriginal parties to ensure that Aboriginal cultural heritage duty of care is fulfilled. A native title agreement may include an ILUA, section 31 agreement or use of the Native Title Protection Conditions. ILUAs are being prepared for the project with the relevant parties for the project and will include specific measures for the management of Aboriginal cultural heritage. If an ILUA cannot be finalised in accordance with the project's requirements, an approved CHMP will be agreed with the relevant parties.

Queensland Heritage Act 1992 (QH Act)

Historic heritage in Queensland is protected under the provisions of the QH Act. This legislation protects all those places included on the Queensland Heritage Register (QHR). It also protects archaeological places where there is an expectation of sub-surface material that can provide information regarding the history of Queensland. Although this Act contains provisions for the protection of indigenous cultural heritage, items that derive their significance solely from their association with Aboriginal custom or tradition are excluded from protection under the QH Act. A non-indigenous heritage assessment was prepared for the project which addresses the QH Act.

Fisheries Act 1994 (Fisheries Act)

The Fisheries Act regulates the management, use, development and protection of fisheries, resources and fish habitats and the management of aquaculture activities. The disturbance of marine plants and the construction and raising of waterway barrier works are administered under the Fisheries Act.

Where waterway barrier works are deemed self-assessable, the works must comply with the Code for self-assessable development, temporary waterway barrier works. If waterway barrier works are not deemed self-assessable, an approval from DNRM will be required prior to works commencing.

Transport Infrastructure Act 1994 (TI Act)

The TI Act regulates infrastructure (including roads, rail, light rail, busways, ports, air, marine and miscellaneous) throughout Queensland and encourages effective integrated planning and efficient management of transport infrastructure.

Approval is required from the Department of Transport and Main Roads (DTMR) and Queensland Rail (QR) to work on, or interfere with, state owned roads and railways respectively.

Sustainable Planning Act 2009

The SP Act establishes the legislative framework for state and local government planning scheme approvals under the IDAS. The SP Act is accompanied by the *Sustainable Planning Regulation 2009* (SP Regulation) which identifies various aspects of development as either assessable, self-assessable, compliance assessable or exempt from assessment.

Activities that are approved under the P&G Act are exempt from the SP Act process. Approvals under the SP Act will be required for activities which are not included in the PPL where these activities are identified within a local planning scheme.

2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

Arrow submitted a voluntary EIS for the Arrow Bowen Pipeline to the Chief Executive of DERM (now DEHP) on 16 December 2011 in accordance with the requirements of Chapter 3 of the EP Act and a Supplementary Report in December 2012. The EIS and Supplementary Report contain commitments made as to the management of environmental impacts during the construction and operation of the pipeline through an EMP contained within the EIS (Chapter 5). Arrow received a decision notice on 8 February 2013 advising that DEHP has approved the EIS and are proceeding with the preparation of an EIS assessment report for this project.

The EIS will form the basis of the information required for a Petroleum Pipeline Licence (PPL) application for a Level 1 EA.

The EIS will be of particular interest to a number of stakeholder groups including:

- Commonwealth and State regulatory agencies and relevant government departments
- Local Government Authorities along the proposed pipeline route

- Landholders, leaseholders, easement holders, native title claimants, residents and business interests along the proposed pipeline route
- Non-Government Organisations including Environmental groups
- Cultural heritage interests
- Mining and petroleum tenement holders.

Consultation with these stakeholder groups has been undertaken and will be on-going throughout the project.

2.6 Public consultation (including with Indigenous stakeholders)

Arrow has developed a Stakeholder Consultation Plan (SCP) which clearly states the stakeholder and community engagement goals, processes and outcomes, and how these will be achieved in a timely and effective manner.

The SCP will be maintained for the duration of the planning, construction and commissioning phases of the project. Arrow will maintain an active stakeholder liaison program during the operational phase.

In accordance with the SCP, Arrow has committed to ongoing consultation with a range of stakeholders for the project, including affected landholders, government agencies and local government. While other interested parties may be identified as the project is progressed, key stakeholders already identified are outlined in Table 2-2.

Consultation methods developed and applied to this Project include:

- One-on-one meetings with local governments, relevant government departments and agencies (including regional offices), Members of Parliament representing the area (State and Commonwealth), landholders, residents, indigenous interests, community groups, business groups and special interest groups
- Individual face-to-face consultations and negotiations with landholders and residents, which are ongoing for the life of the project
- Preparation and wide distribution of printed information, factsheets, project updates and special reports
- Establishment of a database of key stakeholders to advise of progress, to note, and monitor concerns and to open and maintain communication channels
- Use of local newspapers and community announcements to disseminate information at key points in the project

- Internet access to project information
- Community sessions along the proposed pipeline route as appropriate during planning and EIS public comments period
- Regular project group planning and information sharing meetings.

Table 2-2: Stakeholders for the project

Category	Entity
State government advisory agencies and elected representatives	Department of Environment and Heritage Protection
	Department of State Development, Infrastructure and Planning
	Department of Transport and Main Roads
	Department of Natural Resources and Mines
	Department of Communities, Child Safety and Disability Services
	Department of Community Safety
	Queensland Police Service
	Department of Education, Training and Employment
	Queensland Health
	State and Commonwealth Members of Parliament
	Whitsunday Regional Council
	Isaac Regional Council
	Rockhampton Regional Council
	Gladstone Regional Council
Community associations and landcare groups	Capricorn Conservation Council Inc.
	Fitzroy Basin Association
	Gladstone Economic and Industry Development Board
	Mackay Conservation Group
	Queensland Conservation Council
	Calliope Landcare
	Yarwun Targinnine Progress Association
	Mackay-Whitsunday-Isaac Regional Economic Development Corporation
Registered Native Title parties	Birri People (QUD6244/98, QC98/12)
	Jangga People (QUD6230/98, QC98/10)
	Wiri People (QUD372/06, QC06/14)
	Barada Barna People (QUD380/08, QC08/11)
	Darumbal People 2 (QUD6001/99, QC99/1)
	Darumbul People (QUD6131/98, QC97/)
	Port Curtis Coral Coast People (QUD6026/01, QC01/29)
Other LNG proponents	Queensland Gas Company (QGC) / British Gas (BG)

Category	Entity
	Santos / PETRONAS/ TOTAL and Kogas
	Origin Energy / Conoco Phillips
Petroleum and mineral tenement holders	CH4 Pty Ltd (PL)
	Central Queensland Pipeline Pty Ltd (PPL)
	Stanwell Corporation Limited (PPL)
	Jemena Queensland Gas Pipeline (1) Pty Ltd (PPL)
	QCLNG Pipeline Pty Ltd (PPL)
	Surat Gladstone Pipeline Pty Ltd (PPL)
	Peabody (Burton Coal) Pty Ltd (ML)
	Vale Australia (CQ) Pty Ltd (ML)
	Coppabella Coal Pty Ltd (ML)
	Macarthur Coal Pty Ltd (ML)
	Xstrata plc.
	BHP Billiton Ltd
	Aquila
	Queensland Coal Corporation (MLA)
Operators of existing utilities and infrastructure	Ergon Energy
	Powerlink
	Optus
	Telstra
	Queensland Rail (passenger) and Aurizon (rail freight)
	SunWater
	Gladstone Ports Corporation / Central Queensland Port Authority
Landholders	All affected landholders along the proposed pipeline route

Arrow has commenced consultation and notification of landholders directly affected by the proposed pipeline route and compensation will be paid to directly affected landholders in accordance with relevant legislation. Ongoing engagement with landholders about construction activities, land access protocols and environmental management measures will help to reduce uncertainty for property owners about the use of land and help to ensure that construction of the pipeline minimises impacts on farming activities and operations. Consultation and communication with property owners during operation will also help to minimise potential property impacts associated with access by maintenance vehicles.

Consultation with property owners undertaken by Arrow identified a number of concerns of property owners about potential property impacts and disruption to existing farming operations from the proposed pipeline's construction and operation. These included

impacts resulting from the potential spread of weeds between properties and land access issues such as the number of people accessing the property and potential for gates to be left open or fences damaged. The implementation of appropriate management and mitigation measures and land access protocols identified in the EMP will minimise potential impacts on property and farming operations during the construction and operation of the proposed pipeline.

Concerns were also raised by property owners about potential impact on property values and potential for loss of income due to the construction of the proposed pipeline. Given the short term nature of the project and its impacts on properties, the project is not likely to change property values or marketability of properties in areas near the project.

Arrow has contacted and will continue to engage with all landholders affected by the proposed pipeline. The SCP will ensure ongoing community and government consultation, and any social impacts will be mitigated and managed in accordance with these plans. This will ensure that any social and community impacts on existing communities as a result of the project are negligible.

A range of searches of the register of native title claims maintained by the NNTT have been made for the purposes of determining which groups constitute the Aboriginal parties for cultural heritage issues and how much of it lies within their claim area.

On the basis of criteria specified in Section 34 and 35 of the ACH Act, the following currently registered native title claims (in alphabetic order) have standing as the exclusive Aboriginal parties for that portion of the project that falls within their claim boundaries. Approximately 87% of the proposed pipeline route falls into this category:

- Barada Barna (QC08/11, QUD380/08)
- Birri (QC98/12, QUD6244/98)
- Darumbal People (QC97/21, QUD6131/98)
- Darumbal #2 (QC99/1, QUD6001/99)
- Jangga (QC98/10, QG6230/98)
- Port Curtis Coral Coast (QC01/29, QUD6026/01)
- Wiri People Core Country Claim (QC06/14, QUD372/06).

The following also have the status of exclusive Aboriginal parties that lie within an unregistered claim, but do not overlap with any currently registered claim. Approximately three percent of the proposed pipeline route falls into this category:

- Southern Barada & Kabalbara (QC00/4, Q60004/00)
- Wiri #2 (QC98/11, QG6251/98)
- Barada Barna Kabalbara & Yetimarla People (QC01/13, QUD6011/01).

The Barada Barna Kabalbara and Yetimarla People claim overlaps with a section of the Wiri #2 claim.

No native title claim has been registered on three sections of the proposed pipeline route. The areas extend for a distance of approximately 63 km, or just over 10% of the project area and fall between the registered claim areas for:

- Barada Barna and Darumbal People
- Darumbal and Darumbal People #2
- Darumbal and Port Curtis Coral Coast People.

Arrow Energy has concluded ILUAs with the following registered native title parties for the relevant parts of the project which traverses land or waters in which they assert an interest:

- Birri People (QUD6244/98, QC98/12)
- Jangga People (QUD6230/98, QC98/10)
- Wiri People (QUD372/06, QC06/14)
- Barada Barna People (QUD380/08, QC08/11).

Authorised ILUAs with all of the above groups have been presented to the NNTT for registration, which is anticipated before the end of 2011.

Active negotiations towards ILUAs are continuing with two additional registered Native Title parties:

- Port Curtis Coral Coast People (QUD6026/01, QC01/29)
- Darumbul People (QUD6131/98, QC97/21 and QUD6001/99, QC99/1).

It is anticipated that a voluntary agreement will be concluded with the above two groups in the near future.

For the three areas of the project which are not subject to a current NTDA, Arrow has engaged in a process of enquiry and public notification to identify the relevant Native Title parties. In some cases, there were formally registered Native Title claimants for the areas in question. Relevant parties have been identified for each of these areas, and negotiations towards ILUAs and cultural heritage agreements have commenced.

2.7 A staged development or component of a larger project

The Arrow Bowen Pipeline will link Arrow Energy's gas fields in the Bowen Basin to a proposed Arrow Energy GGH in the Aldoga precinct of the Gladstone State Development Area (GSDA) to Arrow Energy's proposed Arrow LNG Plant on Curtis Island.

This proposed action is integrated with the development of Arrow Energy's gas field in the Bowen Basin and the Arrow LNG Plant on Curtis Island. The development timetable is coordinated across the three projects and a staged development is not possible within the total development constraints.

The proposed gasfield development (EPBC referral 2012/6377); pipeline (EPBC referral 2012/6459) and LNG Plant (EPBC referral 2012/5007) are all controlled actions under the EPBC Act.

3 Description of environment and likely impacts

3.1 Matters of national environmental significance

Arrow has undertaken a search of the EPBC Protected Matters Search Tool (October 2012) to identify all potential Matters of National Environmental Significance (MNES) located within a 5 km buffer of the proposed pipeline route.

The following MNES were identified as being potentially present within the Protected Matters Search Area;

- One World Heritage Property – Great Barrier Reef
- One National Heritage Property – Great Barrier Reef
- Commonwealth Lands (Department of Defence associated with Rockhampton Airport)
- Five (5) Listed Threatened Ecological Communities
- 54 Listed Threatened Species
- 22 Listed Migratory Species.

The Protected Matters Search Tool Report is provided as **Appendix 3**.

This section focuses on MNES likely to be affected by project, being 3.1(d) *Listed threatened species and ecological communities* (sections 18 and 18A).

Following identification of the MNES potentially affected by the pipeline, Arrow undertook an assessment of the potential direct and indirect impacts which may result from the construction and operation of the pipeline. The results of the assessment of direct and indirect impacts are presented in Table 3-1.

Following the assessment of potential impacts Arrow undertook field investigations to identify MNES, ecological communities, and other EVNT and non-listed species (State listed species) to identify impacts and to enable mitigation measures to be developed and assessed (such a minor reroutes).

Table 3-1: MNES and potential impacts

Category	Potential Direct/Indirect Impact	Potential Impacts
World Heritage Properties	No Impacts	There are no World Heritage Properties located within the 5 km buffer along the proposed ROW
National Heritage Properties	No Impacts	There are no National Heritage Properties located within the 5 km buffer along the Proposed ROW
Commonwealth Lands	No Impacts	ROW passes 2 km from Department of Defence Logistics Base and Airport.
Listed Ecological Communities	Direct Impacts	<ul style="list-style-type: none"> • Removal of riparian vegetation • Removal of ecological communities • Fragmentation of ecological communities • Introduction of pest and weed species • Rehabilitation failure
	Indirect Impacts	<ul style="list-style-type: none"> • Impacts to water quality from upstream erosion and sedimentation • Impacts from upstream spills or leaks
Listed Threatened Species	Direct Impacts	<ul style="list-style-type: none"> • Loss of individuals from threatened flora and fauna • Loss of fauna habitat for listed and threatened species • Direct impacts through vehicle strikes or trenchfall
	Indirect Impacts	<ul style="list-style-type: none"> • Impacts to water quality from upstream erosion and sedimentation • Impacts from upstream spills or leaks • Introduction of pest and weed species
Listed Migratory Species	No Impacts	Nil expected

Request for additional information	DSEWPaC Comments	Arrow Response
<p>o Black Ironbox, <i>Eucalyptus raveretiana</i></p>	<p>Please clarify that the pipeline route has been selected to avoid Black Ironbox, given that page 28 of the Preliminary Documentation identifies loss of Black Ironbox as a potential project impact.</p> <p>DSEWPaC notes that if Black Ironbox is avoided there will be no direct impacts, but as the species is riparian and essential habitat is located nearby a full assessment of both direct and indirect impacts to this species must be provided. Please also provide mapping to demonstrate where the pipeline right of way will be located in respect of Black Ironbox populations.</p>	<p>The reference to <i>Eucalyptus raveretiana</i> on page 28, Table 3.1 was included as an example of a listed species, which may be directly or indirectly impacted. The purpose of Table 3.1 was the primary screening assessment of potential direct and Indirect impacts and was not intended to quantify any impacts.</p> <p>For the listed species, the assessment of impact is contained within the relevant Species Dossier (such as <i>Eucalyptus raveretiana</i> dossier (Appendix 4)).</p>

3.2 Species Dossiers

On 22 March 2013 DSEWPaC requested the preparation of species dossiers for a number of species potentially impacted by the construction and/or operation of the pipeline. The species dossiers have subsequently been updated in response to a change in the ABP alignment and a request for additional information issued by DSEWPaC on 27 July 2013.

The species dossiers, presented in Appendix 4, contain a description of the threatened species or community, a risk assessment of direct and indirect potential impacts, mitigation measures, residual risk to the species or community and an assessment against the significant impact guidelines.

Request for additional information	DSEWPaC Comments	Arrow Response
<p>Provide a more detailed assessment of impacts for the following listed threatened species and communities:</p> <ul style="list-style-type: none"> ○ Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin ○ Weeping Myall Woodlands ○ Black Ironbox, <i>Eucalyptus raveretiana</i> ○ Squatter Pigeon (Southern), <i>Geophaps scripta scripta</i> ○ Ornamental Snake, <i>Denisonia maculata</i> ○ Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), <i>Phascolarctos cinereus</i> ○ Brigalow Scaly-foot, <i>Paradelma orientalis</i> ○ Dunmall's Snake, <i>Furina dunmali</i> 	<p>Not addressed. A detailed assessment is not provided for any of the below species. DSEWPaC recommends that a species dossier is provided for each species of concern that addresses the significant impact guidelines.</p>	<p>Dossiers are presented in Appendix 4.</p> <p>A brief response to the comments made by DSEWPaC is included in the Arrow Response column.</p> <p>The detailed response to the comments made is presented in the Species Dossier in Appendix 4.</p>
<p>General comments</p>	<p>Please resolve the inconsistency in the amount of Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) in the right of way. The referral documentation identifies 1.08 ha (0.97 RE 11.4.8) and the Preliminary Documentation identifies only 0.11 ha (zero RE 11.4.8).</p>	<p>ABP route as described in this documentation, has been aligned to avoid Brigalow to the greatest extent practicable. The difference in areas is a reflection of this change and is not inconsistent.</p> <p>The calculations presented in this document are based on the most recent route revision and supersede previous submissions and referral documents.</p>
<ul style="list-style-type: none"> ○ Weeping Myall Woodlands 	<p>The Preliminary Documentation states that no Weeping Myall was identified during field surveys and an impact on this community is considered unlikely.</p> <p>There is the potential for an impact on some Weeping Myall Woodlands. Should the proposed action be approved, this will be considered in</p>	<p>Arrow accepts the proposal to consider this species in the project conditioning.</p> <p>Field surveys of suitable REs at 30 sites within 500 metres of the ROW and including the ROW have not identified the presence of any Weeping Myall woodlands. It is unlikely that any Weeping Myall woodlands will be impacted by the Project.</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	project conditioning.	Refer to the Weeping Myall dossier (Appendix 4).
<p>o Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin</p>	<p>Please clarify the amount of Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin to be impacted. Page 31 of the Preliminary Documentation identifies 3.6 hectares of clearance and page 46 identifies that an area of approximately 7.36 hectares will be impacted.</p> <p>Please also provide information about the area of this community surrounding the right of way and potential weed and edge/fragmentation effects on the surrounding community. From the referral documentation it appears that the pipeline will fragment a much larger and possibly important patch of this community. The Natural Grasslands of the Queensland Central highlands and the Northern Fitzroy Basin is particularly vulnerable to fragmentation because of the large extent of existing fragmentation of this community.</p> <p>The preliminary documentation requires mapping of habitat within the project footprint. No additional mapping for this community is provided in the Preliminary Documentation. Please provide revised mapping.</p> <p>DSEWPaC notes the intention to reseed cleared areas of Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin where residual impacts cannot be avoided. This is one of the primary mitigation measures for impacts to this community. Information must be provided around reseeding methodology and how reseeding</p>	Refer to the Natural Grasslands dossier (Appendix 4).

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>will be effective for such a complex ecological community. Information must also be provided around monitoring to ensure success of reseeding and that the cleared area is rehabilitated to the status of Natural Grasslands of the Queensland Central Highlands and Northern Fitzroy Basin. In the event that reseeding and rehabilitation is unsuccessful, a patch of this community will be permanently lost and an even larger patch fragmented. In the event of unsuccessful reseeding the department may require offsets.</p> <p>Weed management is important in managing impacts from the proposed action on this community. The preliminary documentation specifically requests information on weed management for the Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin. This has not been provided. This Community is vulnerable to invasion by exotic weeds, which could be exacerbated by project activities.</p>	
	<p>It would be useful to include an assessment of impacts on King Bluegrass - <i>Dichanthium queenslandicum</i> (including quantification of impact) which is listed as Endangered under the EPBC Act in its own right. The Flora Assessment for the SEIS identifies that this species may occur in the right of way, and Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin represents potential habitat for this species.</p>	<p>Refer to <i>Dichanthium queenslandicum</i> dossier (Appendix 4)</p>

Request for additional information	DSEWPaC Comments	Arrow Response
<ul style="list-style-type: none"> ○ Squatter Pigeon (Southern), <i>Geophaps scripta scripta</i> 	<p>Please clarify how much habitat for the Squatter Pigeon will be impacted by the proposed action. The Preliminary Documentation acknowledges that “the preferred habitat for the Squatter Pigeon occurs in patches throughout the pipeline corridor” however no quantification of impact is provided.</p> <p>Please also provide more information around pre-clearance surveys for Squatter Pigeon nests and how these surveys will inform project design and mitigation, management and avoidance for the Squatter Pigeon. For example, will all nests be avoided if found and appropriate buffer zones be applied, or will work stop and a management plan be developed to ensure no significant impact on the species?</p>	<p>Refer to the <i>Geophaps scripta scripta</i> dossier (Appendix 4).</p> <p>This species occupies a wide variety of habitats including natural grasslands, remnant and regrowth open woodland, highly modified grazing areas dominated by introduced pasture grasses and open ground with little or no cover.</p> <p>The Project has committed to establishing a 50 metre buffer around any active nests found in the pre-clearance surveys along the ROW.</p>
<ul style="list-style-type: none"> ○ Yellow Chat (Dawson), <i>Epthianura crocea macgregori</i> 	<p>Trenchless drilling and appropriate buffers from waterways and riparian areas is crucial to ensuring there is not a significant impact on the Yellow Chat (Dawson).</p> <p>As discussed, more information about potential impacts to the Yellow Chat is required. Please provide detailed mapping of suitable habitat within and adjacent to the project area, including at Twelve Mile Creek and any other creeks or areas that represent habitat. An assessment of indirect impacts, e.g. fragmentation and edge effects (and any downstream impacts if trenchless drilling is not firmly committed to) must also be provided. DSEWPaC notes that this species is critically endangered and therefore there is a higher risk of a significant impact to this species. Please also discuss survey effort, including survey locations and methodology. Demonstrate that surveys were</p>	<p>The <i>Epthianura crocea macgregori</i> dossier and management plan (refer Appendix 4) have been developed in consultation with Wayne Houston (UCQ).</p> <p>In addition to the field surveys conducted by the Project for this species, the dossier includes records published by Birds Australia.</p> <p>Suitable habitat is mapped within the Project Area and a 5 km buffer adjacent to the ROW.</p> <p>The Species Dossier includes a risk assessment which addresses the raw risk (i.e. without mitigation), mitigation measures and residual risk (i.e. after application of mitigation measures).</p> <p>Risk assessments will be updated using field survey (such as incorporating buffers preventing construction near nest sites for this species).</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>undertaken in accordance with DSEWPaC's Survey Guidelines.</p> <p>Please clarify the section of the pipeline construction activities which will not be undertaken during the breeding season for the Yellow Chat. DSEWPaC notes that a preconstruction survey for the Yellow Chat will be undertaken. Please clarify how the results of this survey will inform project activities and mitigation, management and avoidance measures. Mitigation and management measures must be based on sound science.</p> <p>Please provide detail around what will be included in the management plan for the Yellow Chat. The Preliminary Documentation must consider and discuss the recovery plan for this species.</p>	<p>The Project has committed to trenchless crossing techniques at Raglan, Inkerman and Twelve Mile Creeks.</p>
<p>o Grey-headed Flying Fox, <i>Pteropus poliocephalus</i></p>	<p>Trenchless drilling and appropriate buffers from waterways and riparian areas is crucial to ensuring there is not a significant impact on the Grey-headed Flying-fox.</p> <p>The Preliminary Documentation notes that a mixed flying fox camp is located approximately 200 metres from the proposed pipeline location. Please provide more information about this population, including its importance locally and regionally. The documentation states that "extensive areas of preferred habitat were observed in the vicinity of the project site" but it is unclear how much habitat (if any) is present in the right of way and whether this habitat would be used by the nearby population and for what purpose.</p>	<p>Refer to the <i>Pteropus poliocephalus</i> dossier (Appendix 4).</p> <p>The camp contains approximately 5% Grey Headed Flying Foxes and is outside the ROW. The camp is outside the ROW and no direct impact is expected.</p> <p>Flying Fox camps are transitory and pre-clearing surveys will be conducted to confirm the presence of the camp prior to construction. A buffer zone will be established around any active camp.</p>
<p>o Water Mouse, <i>Xeromys myoides</i></p>	<p>Trenchless drilling and appropriate buffers from</p>	<p>Refer to the <i>Xeromys myoides</i> dossier (Appendix</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>waterways and riparian areas is crucial to ensuring there is not a significant impact on the Water Mouse.</p> <p>More information around potential impacts to the Water Mouse is required. An assessment of indirect impacts, e.g. fragmentation and edge effects (and any downstream impacts if trenchless drilling is not firmly committed to for Inkerman Creek) must also be provided. Please also provide more information around survey effort, and whether targeted surveys for the Water Mouse were undertaken.</p> <p>Fragmentation of freshwater and intertidal wetland communities is considered one of the most important issues to the Water Mouse as it can reduce potential feeding resources and nesting opportunities, extend edge effects, promote weed invasion and increase pest densities or their impacts on species such as the Water Mouse.</p> <p>DSEWPaC notes that a preconstruction survey for the Water Mouse will be undertaken to confirm and map the extent of likely Water Mouse habitat associated with Inkerman Creek. Please clarify how the results of this survey will inform project activities and avoidance, mitigation and management measures for the Water Mouse.</p> <p>An individual of this species was captured during the Summer survey within an area associated with Inkerman Creek approximately 150 metres from the proposed alignment. Approximately 0.87 hectares of Water Mouse habitat occurs in the right of way. More information needs to be provided about the population that occurs at</p>	<p>4).</p> <p>The Project has committed to using trenchless construction techniques for crossing Inkerman, Raglan and Twelve Mile Creeks.</p> <p>A buffer will be established around nests and known populations to minimise the risk of direct or indirect impact to this species. Ongoing surveys for this species will inform any establishment of buffers aimed at avoiding impact.</p> <p>The Project will implement management plans to manage pests, weeds and rehabilitation of the ROW post construction.</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	Inkerman Creek and how important this population is locally and regionally (e.g. is this a new and isolated population).	
	The Preliminary Documentation states that 'Trenchless Crossing techniques will be considered at Twelve Mile Creek' to manage impacts to the Water Mouse (page 40). This appears to be an error - trenchless Drilling should be undertaken at Inkerman Creek to mitigate impacts to the Water Mouse.	Agree – erroneous reference to Twelve Mile Creek on page 40. The Project is committed to trenchless crossing techniques at Inkerman, Raglan and Twelve Mile Creeks.
	There are inconsistencies in habitat mapping between the referral documentation (e.g. habitat in the right of way for Ornamental Snake and Black Ironbox) and the Preliminary Documentation. Please clarify these inconsistencies and provide the most up to date habitat mapping for impacts from the proposed action on relevant listed threatened species and communities.	As noted, the ABP route has been realigned. This report and the species dossiers in Appendix 4 provide the most recent information available to the Project. This report should be used in the event of any discrepancy between this report and previous information provided.
○ Ornamental Snake, <i>Denisonia maculata</i>	DSEWPaC notes that 52.37 ha of habitat for the Ornamental Snake will be cleared by the proposed action. This is a large area of habitat and further information around its importance locally and regionally, and indirect impacts such as fragmentation and edge effects to surrounding habitat, must be provided. Mapping indicates that the right of way will result in the fragmentation of larger habitat patches in multiple locations. Arrow must clearly demonstrate, with regard to the Significant Impact Guidelines, that there will not be a significant residual impact on the Ornamental Snake. DSEWPaC notes that significant residual impacts must be offset in accordance with the	Refer to the <i>Denisonia maculata</i> dossier (Appendix 4). This species was not recorded within the ROW, although potential habitat is known to exist. The current estimates of clearing requirements for the Project indicates that 5.3 ha of remnant potential habitat will be cleared for construction purposes. No essential or critical habitat will be cleared as a result of this project. This species is known to inhabit a wide variety of habitat types including moist woodlands and open forests where soil cracks and gilgai mounds occur. More recently the literature reports that surveys

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>EPBC Act Environmental Offsets Policy (October 2012) and associated Assessment Guide.</p>	<p>conducted for a project near Moranbah reports that this species is found in cleared and disturbed areas containing cracking clays and gilgais.</p> <p>Arrow will comply with the offset requirements.</p>
<p>o Fitzroy River Turtle, <i>Rheodytes leucops</i></p>	<p>Trenchless drilling and appropriate buffers from waterways and riparian areas is crucial to ensuring there is not a significant impact on the Fitzroy River Turtle.</p> <p>It is currently unclear if all habitat for the Fitzroy River Turtle will be avoided by physical infrastructure and clearing and construction activities, or whether some habitat will be disturbed (e.g. by access tracks). It is also unclear whether disturbance will only take place during the non-breeding season. If disturbance (direct or indirect) will take place to habitat this must be quantified (where possible) and a detailed assessment of impacts on the Fitzroy River Turtle provided.</p> <p>DSEWPaC notes that a preconstruction survey for the Fitzroy River Turtle will be undertaken. Please clarify how the results of this survey will inform project activities and avoidance, mitigation and management measures (e.g. if a turtle nest is found will a buffer zone be applied and no access permitted within this buffer zone?). Mitigation and management measures must be based on sound science.</p> <p>Please provide more detail around how Arrow will ensure areas of habitat for the Fitzroy River Turtle will not be accessed by construction crews, particularly during the spring breeding season.</p>	<p>Refer to the <i>Rheodytes leucops</i> dossier (Appendix 4).</p> <p>Field habitat assessments have identified two areas where this species is likely to occur (Isaac and Fitzroy Rivers).</p> <p>Trenchless crossing techniques will be used at the Isaac and Fitzroy rivers to avoid impact to likely habitat at these locations.</p> <p>In the event that pre-construction surveys identify nests a 50 metre buffer will be established around the site to avoid disturbance. No construction activity will be permitted within the buffer zone.</p> <p>Primary habitat for this species includes sandy banks, deep pools and riffle zones. The use of trenchless technology to cross the Isaac and Fitzroy rivers will avoid direct and indirect impact to these habitat zones.</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>The Preliminary Documentation identifies that it is important to maintain drainage patterns and water quality in regions where the Fitzroy River Turtle occurs. Please provide more information on how drainage patterns and water quality will be maintained specifically in respect of the Fitzroy River Turtle.</p>	
<p>o Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), <i>Phascolarctos cinereus</i></p>	<p>Not addressed. No assessment of impacts is provided. Arrow must clearly demonstrate, with regard to the Significant Impact Guidelines, that there will not be a significant residual impact on the Koala. DSEWPaC notes that significant residual impacts must be offset in accordance with the EPBC Act Environmental Offsets Policy (October 2012) and associated Assessment Guide.</p>	<p>Refer to the <i>Phascolarctos cinereus</i> dossier (Appendix 4). Arrow will comply with offset requirements.</p>
<p>o Brigalow Scaly-foot, <i>Paradelma orientalis</i></p>	<p>Not addressed. No assessment of impacts is provided. Arrow must clearly demonstrate, with regard to the Significant Impact Guidelines that there will not be a significant residual impact on the Brigalow Scaly-foot. DSEWPaC notes that significant residual impacts must be offset in accordance with the EPBC Act Environmental Offsets Policy (October 2012) and associated Assessment Guide.</p>	<p><i>Paradelma orientalis</i> was removed from the EPBC Act 1999 list of threatened species on 15 May 2013 and no assessment is provided in this report.</p>
<p>o Dunmall's Snake, <i>Furina dunmali</i></p>	<p>Not addressed. No assessment of impacts is provided.</p>	<p>Refer to <i>Furina dunmali</i> dossier (Appendix 4). Dunmall's Snake was not recorded (or reported in published databases) in or adjacent to the ROW during surveys. The Project will conduct further surveys to determine the likely presence of this species being present.</p>

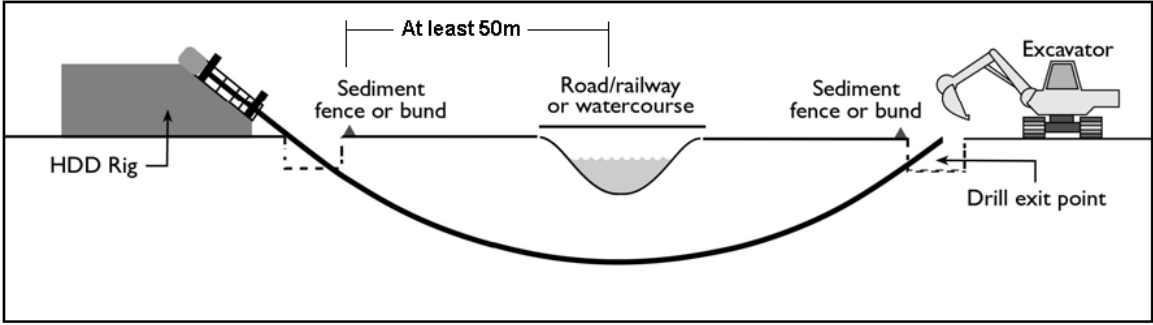
Request for additional information	DSEWPaC Comments	Arrow Response
		Mitigation measures are proposed in the dossier and these will be revised following the field assessment program.
Information provided for each above listed species must include, but is not limited to, survey effort and methodology, amount and type of habitat to be impacted, indirect impacts (for example weed invasion or fragmentation), maps depicting habitat to be impacted, and avoidance, mitigation and management measures specific to each species (for example weed management strategies for the Bluegrass ecological community). Where an impact on a species is avoided this should be stated.	Not addressed. See comments above. DSEWPaC recommends that a species dossier is provided for each species of concern that addresses the Significant Impact Guidelines. This must include information on survey effort for each species, quantification of impact, indirect impacts including downstream impacts, edge effects and fragmentation, revised and detailed mapping for each species and a detailed discussion of specific mitigation measures, particularly where species are vulnerable to impacts (such as weed invasion).	Refer to significant species dossiers (Appendix 4).
	DSEWPaC notes that the Terrestrial Ecology Report to the SEIS has identified that the Yakka Skink has the potential to be adversely impacted by the proposed action. While information on the Yakka Skink can be found in the detailed EIS and SREIS prepared for the Queensland Government it would be useful for Arrow to provide an assessment of impacts on the Yakka Skink (including quantification of impact) in the Preliminary Documentation (preferably in the form of a species dossier).	A Species Dossier on the Yakka Skink is included in Appendix 4.
Where surveys are proposed prior to construction (for example the Squatter Pigeon), information must be provided around how survey results will inform construction activities (for example placement of infrastructure) to avoid, mitigate or manage impacts. Impacts to habitat must be quantified for these species.	Not addressed. See comments above.	This information is included in the significant species dossiers (Appendix 4).

Request for additional information	DSEWPaC Comments	Arrow Response
<p>Provide sufficient detail around offsets for any residual significant impacts on listed threatened species or communities.</p> <p>Offsets must comply with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (October 2012) and accompanying Offsets assessment guide, accessible from: www.environment.gov.au/epbc/publications/environmental-offsets-policy.html</p>	<p>See comments above in respect to offsets.</p>	<p>This information is included in the significant species dossiers as relevant (Appendix 4).</p> <p>The Project will comply with the EPBC Act Offset Policy.</p>

4 Measures to avoid or reduce impacts

The proposed pipeline alignment has been developed with the aim of minimising the potential impacts on EPBC listed species and ecological values.

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>An assessment of indirect and downstream impacts to listed threatened species and communities (see section 4.5.2 onwards) should be provided in respect of each individual listed threatened species or community, preferably in a species dossier that addresses the significant impact guidelines (rather than a more general discussion). This will ensure a robust assessment of impacts from the project on each individual listed threatened species and community. For example, changes to flow regimes is identified as a potential downstream impact but is not discussed in respect of individual listed threatened species or communities that may be impacted or threatened by downstream impacts.</p>	<p>Refer to the attached significant species dossiers (Appendix 4).</p>
	<p>Please clarify if the mitigation measures in the referral documentation continue to apply in addition to the mitigation measures and information presented in the Preliminary Documentation. DSEWPaC notes that the referral documentation and the additional information provided during the referral stage must be published as part of the Preliminary Documentation.</p>	<p>Yes – all mitigation measures presented in the referral documentation continue to apply.</p>
<p>Provide information detailing Arrow Energy's commitment to using trenchless drilling technologies (either horizontal directional drilling or micro tunnelling) for the crossing of waterways and locations where trenchless drilling will be used (for example the Fitzroy and Isaac Rivers, and Twelve Mile, Raglan and Inkerman Creeks).</p>	<p>It remains unclear whether Arrow is committing to trenchless drilling for the Fitzroy and Isaac Rivers, and Twelve Mile, Raglan and Inkerman Creeks.</p> <p>For example, statements such as "this technique [open cut construction] will also be used for crossing watercourses should geotechnical investigations not support proposed trenchless</p>	<p>Arrow is committed to trenchless crossing techniques on the Fitzroy and Isaac Rivers, and Twelve Mile, Raglan and Inkerman Creeks.</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>crossing technologies” (page 59) and “water quality management strategies will be implemented to reduce any direct, indirect and downstream effects should trenchless crossing techniques not be possible” (page 60) suggest that Arrow cannot fully commit to trenchless drilling. If this is the case, a detailed assessment of impacts on listed threatened species and communities must be provided in the event that trenchless drilling cannot be undertaken for the Fitzroy and Isaac Rivers, and Twelve Mile, Raglan and Inkerman Creeks (e.g. for the Fitzroy River Turtle, Yellow Chat, Grey-headed Flying-fox and Water Mouse).</p>	
<p>Also provide information detailing Arrow Energy’s commitment to appropriate buffers zones for waterways from project actions, including trenchless drilling activities.</p>	<p>Not addressed. As discussed, clear buffer zones must be committed to for waterways from project activities and in particular waterways and riparian areas that represent habitat for listed threatened species and communities.</p>	<p>Arrow has committed to 50m buffer zones for watercourse crossings where trenchless crossing technologies are to be undertaken as illustrated on the schematic below.</p>
		
<p>If information detailing Arrow Energy’s commitment to trenchless drilling and appropriate buffer zones cannot be provided, present a detailed assessment of impacts (including downstream impacts), survey effort and methodology, amount and type of habitat to be impacted, maps depicting habitat to be impacted, and avoidance, mitigation and management measures specific to</p>	<p>See comments above.</p>	<p>Arrow has committed to trenchless crossings of Inkerman, Raglan and Twelve Mile creeks as well as the Isaac and Fitzroy Rivers.</p> <p>Detailed assessments of the potential impact on each species is included in Appendix 4.</p>

Request for additional information	DSEWPaC Comments	Arrow Response
<p>each species including but not limited to:</p> <p>Yellow Chat (Dawson), <i>Epthianura crocea macgregori</i></p> <p>Fitzroy River Turtle, <i>Rheodytes</i></p> <p>Grey-headed Flying Fox, <i>Pteropus poliocephalus</i></p> <p>Water Mouse, <i>Xeromys myoides</i></p>		
	<p>There are inconsistencies in habitat mapping between the referral documentation (e.g. habitat in the right of way for Ornamental Snake and Black Ironbox) and the Preliminary Documentation. Please clarify these inconsistencies and provide the most up to date habitat mapping for impacts from the proposed action on relevant listed threatened species and communities.</p>	<p>As noted, the ABP route has been realigned. Refer to this Preliminary Documentation for the current and most up to date information.</p>
	<p>Weed mitigation and management is particularly important in managing impacts to listed threatened species and communities and should be discussed in more detail in respect of individual listed threatened species and communities that are vulnerable to weed impacts (including in riparian zones). Clear commitments around weed management and control strategies must be provided.</p>	<p>A Weed Management Plan will be developed for the Project as part of the Construction Environmental Management Plan. Species specific management measures relevant to MNES are included in the dossiers (Appendix 4).</p>
	<p>Please provide more detail around how rehabilitation will be achieved, particularly where rehabilitating to the structural characteristics of ecological communities that consist of complex vegetation structures. Please discuss methodology and the effectiveness of using local provenance seed to rehabilitate cleared areas, and proposed monitoring to ensure rehabilitation is successful and has returned the vegetation and habitat characteristics that existed pre-clearing. This is particularly important where habitat for listed</p>	<p>Information on rehabilitation for different habitats has been included in the species dossiers (refer Appendix 4).</p>

Request for additional information	DSEWPaC Comments	Arrow Response
	<p>threatened species and communities is being cleared (e.g. Ornamental Snake) and where rehabilitation is being used as a management and mitigation measure.</p> <p>Also provide more detail explaining how potential failure of rehabilitation will impact on individual listed threatened species and communities (noting that rehabilitation is proposed as a mitigation measure for some listed threatened species and communities).</p>	
	<p>The Preliminary Documentation contains a number of references to offsets. Following discussions with Arrow, DSEWPaC understands that offsets for impacts to listed threatened species and communities are not being proposed. Please remove reference to developing a program of offsets (e.g. pages 49 and 50) or make it clear that these offsets are not offsets for significant residual impacts to threatened species and communities listed under the EPBC Act, and are for state requirements only. Please also discuss if any state offsets will benefit EPBC listed threatened species and communities, in particular the Ornamental Snake and the Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin.</p>	<p>Proposed offsets are for State requirements only at this stage. Arrow will comply with the Federal Government requirements in relation to offsets.</p>
	<p>Should the project be approved, DSEWPaC is likely to require management plans where a species that is not accounted for in conditioning is found during pre-clearance surveys.</p>	<p>Arrow has noted this requirement. The Significant Species Management Plan will include measures to manage threatened species not already identified during surveys and therefore not included specifically in conditions imposed on the project by DSEWPaC.</p>
<p>General Comments</p>	<p>DSEWPaC expects pre-clearance survey methodology and results to be made publically available.</p>	<p>This information will be made available on Arrow Energy's website as necessary. http://www.arrowenergy.com.au/pr</p>

Request for additional information	DSEWPaC Comments	Arrow Response
		objects/arrow-bowen-pipeline

4.1 Indirect impacts from water crossings

The pipeline route traverses three river basins including the Burdekin, Fitzroy and Calliope River basins with the majority of the proposed pipeline route being contained within the Fitzroy Basin (refer to Table 4-1). The Fitzroy Basin is the largest basin in Queensland and drains via the Fitzroy River to the eastern seaboard through the city of Rockhampton in Central Queensland.

Table 4-1: River basins crossed by the project site

Project location (approximate)	River basin
AB0 to AB37	Burdekin
AB37 to AB474 SL0 to SL25.8 DL0 to DL24.6	Fitzroy
AB474 to KP483	Calliope

The proposed pipeline route will cross a number of perennial, seasonal and intermittent watercourses including rivers, streams, floodplains and wetlands.

An assessment of key watercourses located along the proposed pipeline route has been undertaken. This included watercourse surveys conducted in winter and spring, 2011 and autumn and winter, 2012. Watercourse crossings assessed contained one or more of the following criteria:

- stream order of 4 or above
- remnant vegetation mapped by Queensland Herbarium
- significant band of riparian vegetation visible in satellite imagery
- open water visible in satellite imagery.

Many of the watercourses traversed by the proposed pipeline route are typical of Australian inland waters, being ephemeral with intermittent or little to no flow during the drier months or between rainfall periods. The majority of watercourses within the project area are highly modified as a result of extensive clearing and existing land use practices. Water quality

within the project area is highly variable and affected by catchment conditions and land use practices. Additionally, quality is greatly influenced by rainfall events, with many waterways having an absence of flow for extended periods.

The Fitzroy River is the largest river system crossed by the proposed pipeline route with a total catchment area in excess of 133,000 km². The Fitzroy River is a large watercourse with a 50 m wide flowing channel at the crossing point AB 322.5

Other significant crossings for which alternative techniques may be considered include crossings of the Isaac River (AB 237.5), Inkerman Creek (AB 435.0), Twelve Mile Creek, (AB 433.8) and Raglan Creek (AB 451.6).

Potential indirect and downstream impacts to matters of MNES include:

- Indirect disturbance or loss of habitat areas and environmental values from;
- Removal of riparian vegetation
- Impacts to water quality from upstream erosion and sedimentation
- Impacts to water quality from upstream spills or leaks
- Leaching from excavated acid sulfate soils
- Rehabilitation failure
- Introduction of pest and weed species
- Changes to water flow regimes.

Arrow undertook a review of construction, operation and decommissioning activities that could result in an indirect or downstream threatening process to MNES. The result of this assessment was the identification of the following pathways that could lead to indirect and downstream impacts as well as the development of a suite of control strategies that may provide control over the pathways associated with indirect and downstream impact:

- Removal of riparian vegetation
 - Indirect and downstream impacts could result from exposure of soils and increased erosion risk associated with vegetation removal. Some change in water quality may occur should organics from clearing operations be released into the waterway.
 - Impacts to water quality from upstream erosion and sedimentation
 - Likely erosion sources as a result of project construction include potential scouring of backfilled trenches in creek beds and banks as well as rilling and gullyng of the easement on creek approaches and banks.

-
- Pipeline construction activities have the potential to affect water quality at watercourse crossings subject to flowing water, primarily through the potential disturbance and mobilisation of sediments.
 - The risk of these impacts is increased during periods of moderate to high flow, when disturbed sediments can be mobilised and transported large distances downstream.
 - Impacts to water quality from upstream spills or leaks
 - Potential contamination of existing water resources and water quality from the accidental spillage or leakage of hazardous chemicals and substances could have the potential to cause environmental harm to surface waters and habitats downstream.
 - Construction activities will use relatively small quantities of chemicals and fuel, and therefore potential spill volumes will be low. However, without appropriate controls, project related activities may result in localised impacts on natural resources, such as soils, surface water or groundwater contamination from spills of fuel or chemicals.
 - Impacts to water quality from upstream spills or leaks
 - Potential contamination of existing water resources and water quality from the accidental spillage or leakage of hazardous chemicals and substances could have the potential to cause environmental harm to surface waters and habitats downstream.
 - Construction activities will use relatively small quantities of chemicals and fuel, and therefore potential spill volumes will be low. However, without appropriate controls, project related activities may result in localised impacts on natural resources, such as soils, surface water or groundwater contamination from spills of fuel or chemicals.
 - Leaching from Acid Sulphate Soils (ASS). Acidic run-off and leaching from excavated acid sulphate soils (ASS) can result in degradation of water quality. The proposed pipeline route traverses land that has no known occurrence of ASS or low probability of ASS for almost the entire length of the route. There may be some soils classed as high probability for presence of ASS or potential acid sulphate soils (PASS) in the low lying areas of Bajool – Port Alma area.
Two soil samples taken from within the low lying area near AB 437 were analysed for Potential Acid Sulfate Soil. These samples did not contain detectable levels of oxidisable sulphur and are not considered to be ASS.
 - Rehabilitation failure

- This pathway will be associated with the operational phase and could be related to damage from meteorological events (such as floods) or from the failure of the rehabilitation to stabilise the watercourse (e.g. through the death of plants).
- Introduction of pest and weed species
 - There are a number of weed species common throughout the riparian zone including *Lantana spp*, *Parthenium hysterophorus* (Parthenium weed) and *Parkinsonia aculeate* (Parkinsonia).
 - There is a risk that construction activities could potentially promote the spread of weed species found in riparian areas along the proposed pipeline route. The aquatic weed, Elodea/Egeria, may be present within watercourses in the region, especially following a significant rainfall event. The risk of spreading aquatic weed Elodea/Egeria from construction activities is low, as the weed does not persist in intermittently flowing streams.
 - A search of DERM's/DEHP Wildlife Online Atlas indicated that two introduced aquatic fish species, Gambusia (*Gambusia Holbrooki*) and the Guppy (*Poecilia reticulata*) are known to occur within the project area. Only Gambusia was observed during the field survey. Construction activities are not likely to result in the spread of Gambusia, however, potential impacts to water quality from construction activities may create a more favourable environment for existing Gambusia populations.
- Changes to water flow regimes
 - See section 4.3

Request for additional information	DSEWPaC Comments	Arrow Response
	The Preliminary Documentation identifies groundwater contamination and acid sulphate soils as a potential impact. These impacts should also be discussed in respect of individual listed threatened species and communities (where relevant).	Current assessment results have not identified any threat to MNES from groundwater contamination or potential ASS. Appropriate management measures will be included in the SSMPs as relevant. Assessment of the risks associated with changes to groundwater are included in the species dossiers

The risk that these threatening processes may result in indirect or downstream impacts is highest during the construction period. During operational periods there is a low risk of indirect or downstream impacts, typically associated with weed control or rehabilitation failure.

Using the suite of control strategies identified below the indirect and downstream impacts on MNES can be avoided and managed. Consequently, no indirect and downstream impact on MNES would be expected from construction and operation of the ABP.

A summary of the key management measures that will be used to reduce the potential impacts on MNES is outlined below:

- Removal of riparian vegetation
 - Trenchless technologies, such as HDD, are proposed for the crossing of major waterways: Fitzroy River, Isaac River, Inkerman Creek, Twelve Mile Creek and Raglan Creek.
 - Topsoil (containing the natural seed bank) will be removed, stockpiled and then re-spread across rehabilitation areas as soon as possible following disturbance.
 - Vegetation re-establishment should be monitored during and after construction.
- Erosion from short-term temporary soil stockpiling;
 - This is a construction activity with stockpiling only occurring during the period between clear and grade of the route and rehabilitation.
 - To control the indirect and downstream risks material should not be stored where there is a direct transmission pathway to a watercourse (e.g. erosion and sediment control).
 - Additional controls can be utilised by avoiding stockpiling activities where there is a risk of flooding (e.g. placing the stockpile above a flood height or scheduling construction during the seasonally drier months).
- Impacts to water quality from erosion and sedimentation
 - Using Trenchless technologies, e.g. HDD, for the crossing of major waterways: Fitzroy River, Isaac River, Inkerman Creek, Raglan Creek and Twelve Mile Creek.
 - Scheduling construction to occur during periods of no or low flow in combination with erosion and sediment controls
 - If watercourse flowing, dam and impound to enable construction to occur in dry conditions.
 - The crossings, including vehicular and maintenance tracks, will typically be at right angles to the direction of water flow to minimise scour potential.
 - Creek banks will be profiled and reinstated as near as practicable to their former profile following construction. Accordingly, there will be no change to water flow regimes as a result of construction.
 - Where practicable, large riparian trees and rootstock will be retained for bank stabilisation.

- During trenching, the use of sediment fences and flotation curtains within the watercourse will be utilised to minimise the potential for sedimentation.
- Undertake water quality monitoring upstream and downstream of the crossing point (if the watercourse is flowing).
- Watercourse crossings are generally scheduled for construction outside the wet season in order to minimise the risk of potential sedimentation. As outlined in the EMP, erosion and sediment controls are implemented on the banks of the watercourse, plus the ROW to ensure that the risk of any sedimentation of the watercourse is minimised to as low as reasonably practicable. This may include the installation of temporary sediment ponds. It should be noted that trenching across a watercourse does not occur until the pipe is ready to be laid in the watercourse. Typically, one to three days would be required to trench a watercourse, lay the pipe and cover the pipe to return the bed to its original profile. Should flow diversion be required, Arrow anticipates the time taken to dam the watercourse (coffer dam), trench, lay and cover the pipe and remove the coffer dam is 7 to 10 days.
- Impacts to water quality from upstream spills of hazardous materials
 - No storage of hazardous materials in watercourses (or conducting refuelling or transfer of hazardous materials in watercourses)
 - Ensuring that spill kits are available at waterway crossings
 - Ensuring that crossings are conducted during periods of no, low or controlled flows
 - Erecting barriers to prevent transmission of any spills beyond the Project footprint
 - Ensuring that chemicals are not mixed in waterways
 - Undertake water quality monitoring upstream and downstream of the crossing point
- Water quality impacts from Acid Sulphate Soils (ASS)
 - Mapping ASS/PASS so that areas where these soils may be present are known and mitigation strategies applied
 - Preventing oxidation of ASS/PASS
 - Separation of ASS/PASS in a dedicated treatment area where neutralising treatment can be applied and leachate captured
 - Ensuring disposal of treated ASS/PASS does not result in runoff to impact MNES
 - Undertake water quality monitoring upstream and downstream of the crossing point, to verify mitigation measures are effectively preventing impacts from ASS.
- Introduction of pest and weed species

- Weeds will require control across both construction and operational periods and could result in indirect and downstream impacts on MNES during either phase.
- During construction periods ensuring that vehicles are cleaned for that particular area to prevent introduction of weeds to an area
- Undertaking regular inspections to identify any introduced pest or weed species and to verify efficacy of mitigation measures

Request for additional information	DSEWPaC Comments	Arrow Response
	Page 56 – last dot point on this page is incomplete.	Undertaking regular inspections to identify <u>any introduced pest or weed species and to verify efficacy of mitigation measures.</u>

- Control strategies to reduce the risk of indirect or downstream impact from weeds are available and could include:
 - Where chemical treatments are applied ensuring these chemicals are used in compliance with regulations and practices
 - Ensuring that those applying chemical treatments have the necessary licenses and permits to undertake the application
 - No mixing of chemical concentrates within the waterway crossing
 - Consideration of meteorological conditions to prevent chemicals washing into watercourses
 - Use of non-chemical weed controls (such as physical removal).
- Rehabilitation failure
 - Use of appropriate civil engineering standards to create stable landforms
 - Creek banks will be profiled and reinstated as near as practicable to their former profile following construction. Accordingly, there will be no change to the hydraulic regimes of any watercourse following construction and rehabilitation.
 - Use of local provenance seed to rehabilitate areas
 - Retain rootstock to assist with binding banks to increase stability and to assist with regeneration of vegetation in the area.
 - To aid rehabilitation, typical seeding of the watercourse banks with a fast-growing native grass (e.g. *Themeda australis*) or other suitable fast-growing species, or the use of hydro mulching (in the event of dry conditions) is undertaken. Where practicable, large trees and root stock will be retained for stabilisation of the banks.

Risks to MNES from construction and operation of the pipeline (including flow regimes, water quality and flooding) is managed through effective implementation of management measures as outlined in the EMP to:

- ensure appropriate erosion and sediment control measures are in place
- monitoring of climatic conditions during construction
- scheduling of watercourse construction outside the wet season
- undertaking best practice techniques to minimise the period of time the pipeline trench is open in the watercourse as described above
- effective stabilisation and rehabilitation of watercourse banks and the ROW and
- no change to flow regimes within any watercourse.

The effective implementation of the management measures and monitoring as outlined in the EMP will reduce any potential downstream effects on Great Barrier Reef World and National Heritage values. On-going continuous monitoring of the performance of the EPC Contractor by Arrow audit personnel during construction, together with post construction audits and independent audits will ensure that the performance indicators as outlined in the EMP are maintained and any corrective action is implemented as necessary.

4.2 Indirect impacts from changes in flow regimes and water quality

The majority of watercourses anticipated to be traversed by the proposed pipeline route are typical of Australian inland waters, being ephemeral with intermittent or little to no flow during the drier months. Based on an assessment of DERM's database for the minimum and maximum mean monthly flows, it has been determined that watercourses traversed by the proposed pipeline route have maximum flows in January and February, with the lowest flows in August and September.

Watercourse crossing during construction activities can potentially affect the flooding regime, and increase risks associated with erosion (including scour) and landslip if appropriate management measures are not implemented. Arrow will implement an Erosion and Sediment Control Plan to manage risks associated with erosion during the construction and operation of the pipeline.

The greatest risk will be during the initial wet season flows following construction but prior to successful rehabilitation. High discharge velocities, as well as variations in velocity or flow

path, could lead to failure of rehabilitation along the ROW. This is especially true of dispersive soils in approaches to streams.

Rain could collect in the unconsolidated trench, backfill and trace the trench downslope toward the nearest stream, resulting in gullying of the trench and possible bank failure.

Sheet flows could collect in shallow depressions over the backfilled trenches and channelise, causing rilling and gullying.

Potential downstream impacts to MNES through changes to water flow regimes, water quality and flood events is expected to be low due to the following mitigation measures:

- Watercourse crossings are located well away from the Great Barrier Reef World Heritage and National Heritage areas.
- Trenchless crossing techniques are proposed for the crossing of major waterways: Fitzroy River, Isaac River, Inkerman Creek, Raglan Creek and Twelve Mile Creek.
- Flow diversion techniques will be used where flowing water is present during open cut crossings to minimise increase in turbidity.
- Flows to downstream water users and environment will be maintained throughout construction in flowing waterways.
- Additional stormwater diversion banks/drains (e.g. whoa-boys) are to be placed at an appropriate distance from each side of the top of the watercourse embankment, as specified within the Erosion and Sediment Control Plan.
- Construction of watercourse crossings will be scheduled during the dry season wherever practicable when the intermittent rivers and streams traversed by the pipeline are generally not in flow.
- Activities involving the disturbance of soil will be managed through the implementation of an Erosion and Sediment Control Plan.
- Arrow will undertake an inspection program to ensure the rehabilitation program is functioning in accordance with design and to enable repairs to be completed as necessary.
- No change to waterflow regimes.
- Water quality monitoring undertaken upstream and downstream in flowing watercourses.
- Managing risk of flooding by scheduling watercourse crossings outside the wet season when flooding or high flows may occur which could lead to potential erosion and sedimentation of watercourses. In particular, the use of trenchless techniques (e.g.

HDD) for major watercourses including the Isaac River and Fitzroy River which also eliminates disturbance to the banks of these watercourses.

4.3 Non-trenchless watercourse crossings

The majority of watercourse crossings are expected to be constructed using standard open cut (trenching) construction. This technique is most suited for dry or low flow conditions.

Flow diversion (illustrated in Figure 4-1) is a modification of the standard open cut method where higher water volumes and flows (typically <1,000 L/s) are present. Techniques include:

- Concentrating the flow through a flume pipe to prevent siltation problems that may be created during trenching, lowering in and backfilling (not suitable for watercourses with broad channels, low gradients and permeable substrates); and
- Pumping water around the work area by constructing barrier dykes / head walls above and below the trenched area keeping the work area relatively dry (suitable for low gradient streams with a discharge < 1,000 L/s).

If access is required across a flowing watercourse, the water is directed through a diversion pipe and a causeway constructed over the watercourse to allow the passage of construction traffic.

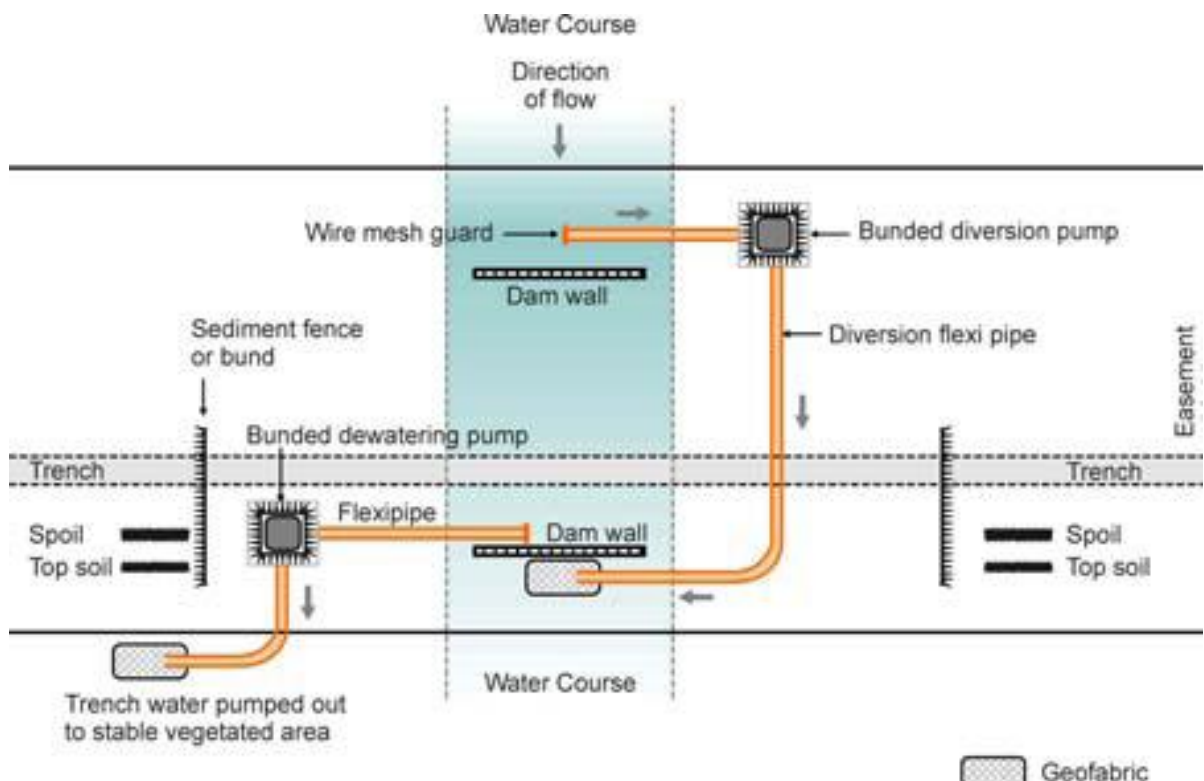


Figure 4-1: Example of flow diversion - Source: ABP EIS

The potential indirect impacts of watercourse crossings on MNES are discussed in Sections 4.1 to 4.3.

Water quality management strategies (e.g. will be implemented to reduce any direct, indirect and downstream effects should trenchless crossing techniques not be possible.

Watercourse banks will be reinstated as near as practicable to their original profile. Where required, geofabric (for example, jute matting), which remains permeable to water and enhances plant growth, will be used to hold soil in place during re-establishment. Vegetation is then reinstated, usually involving initial seeding with sterile grasses (for example, millet or rye corn) to facilitate revegetation and stabilisation of watercourse banks. Subsequent revegetation of the crossing will aim to re-establish native plant species through rootstock left in place, natural regeneration and / or seeding. Following construction, reinstatement will be monitored during an inspection schedule and access may be restricted to facilitate rehabilitation.

Construction involves establishing a stable working platform either side of the watercourse and creating a trench using excavators. Tie-in points will be located on high ground well away from any water flow.

Trench spoil removed from the watercourse will be placed above the bank, with erosion and sediment controls near the stockpile areas as appropriate. Trench and backfill activities will be undertaken to ensure that bed and bank material is stockpiled separately and returned to the trench to match original conditions.

The pipe to be used for watercourse crossings and in areas of significant inundation (as identified by risk assessment in compliance with AS 2885.1) may be ballasted by concrete coating.

Welded pipe will be laid in the trench and spoil material returned to the trench. Rock protection will be placed over the trench in the stream bed where required, to prevent potential scouring during high water flow conditions. The crossing point will be rehabilitated following installation of the pipe, any access tracks will be removed and the banks restored.

Key environmental issues associated with watercourse crossings include:

- Soil erosion and sedimentation of land and water
- Bank degradation

- Impacts on riparian and aquatic flora and fauna
- Disturbance to heritage sites
- Temporary obstruction of other land users.

The primary environmental objectives include:

- To minimise impacts on riparian, aquatic and water dependent flora and fauna
- To minimise erosion and sedimentation impacts
- To maintain water quality and water flow requirements
- To minimise impacts on heritage sites
- To maximise rehabilitation success of achieving long term site stability.

To minimise the period of construction and subsequent environmental disturbance, watercourse crossings will be undertaken within the shortest period practicable. It is anticipated that construction will occur during winter months when there is less rainfall and watercourses are usually at their lowest flow level.

Where possible, in places where trenchless techniques are not used, crossings will be constructed while the watercourse is dry using the open cut trenching method. If water flow is present, it will be transported across the trench via flume pipes or, alternatively, the watercourse will be temporarily dammed and the water flow pumped around the crossing site.

ABP has adopted the following activity management measures presented in the APIA Code for watercourse crossings, including:

Planning and Design

- The total number of watercourse crossings was minimised during the pipeline route selection.
- Site specific watercourse crossing techniques was determined by on site surveys following consideration of environmental values (natural and social).
- Site specific management plans or engineering drawings shall be developed for significant waterway crossings detailing construction and environmental management requirements. Utilise relevant erosion and sediment control guidelines and ensure appropriate monitoring to determine adequacy of controls.
- Watercourse crossings shall be designed in a manner which minimises the risk of scouring (e.g. the crossing location shall be at low velocity, straight sections with pipeline orientated as near to perpendicular to water flow as practicable).

- Where practicable, watercourse crossings shall be scheduled during dry or low flow periods and shall avoid periods of fauna sensitivity. Consideration of tidally influenced waters shall also be required.
- Crossings shall be completed promptly in order to minimise impacts.
- Schedulers shall remain vigilant regarding flood warnings, receiving daily weather reports and subscribing to flood warning services where relevant.

Vehicle Access

- All equipment required for the crossing shall be on-site and in good working order prior to work commencing on the crossing.
- All hydraulic, fuel and lubricating systems of machinery used in the watercourse crossing shall be in good repair in order to avoid water pollution.
- Construction machinery shall be certified weed free prior to allowing access to the watercourse.
- Access tracks/roads shall, where practicable, avoid crossing waterways. Where possible, water course crossings shall be:
 - associated with existing crossing points or disturbed areas;
 - through the stream bed within the pipeline construction area corridor at dry waterway crossings (e.g. ephemeral streams). However, access shall be limited, where practicable, to vehicles and equipment essential to construction at the site, or
 - via culvert causeways, bridges or other such crossing structures.
- Crossings shall be designed and constructed in a manner which minimises sediment release into waterways, does not prevent water flows and is capable of accommodating locally significant rainfall events.

Clearing at Watercourses

- Where practicable, clearing slopes leading to watercourses shall be delayed until construction of the crossing is imminent, thus minimising erosion and sedimentation risk.
- Alternatively, other soil protection methods shall be applied - refer section 4.13 Erosion and Sediment Control.
- Cleared vegetation shall be stockpiled away from watercourses and shall not be stored or, where practicable, felled so as to land in watercourses.
- At ecologically sensitive watercourse crossings mechanical slashers shall be considered for use in clearing activities.

Grading at Watercourses

Erosion and sedimentation resulting from grading adjacent to watercourses will be managed by:

- where practicable, not grading topsoil from the pipeline construction area on watercourse approaches, thus allowing the undisturbed organic mat to remain in situ
- delay grading of banks and slopes leading to watercourses until construction of the crossing is imminent, thus minimising erosion and sedimentation risk
- grading soil away from the watercourse stockpiling soil at an appropriate distance from the watercourse or behind adequate stockpile berms.
- Where the stream bed consists of rocks, pebbles or coarse gravel overlaying finer material, this material shall be removed and stockpiled separately for replacement during reinstatement.

Trenching at Watercourses

Diversion dams shall be constructed of appropriate materials which will minimise watercourse sedimentation, such as steel plates, sand bags or inflatable dams (e.g. Aquadam™). The use of unprotected earthen dams is not proposed.

Erosion and sedimentation resulting from trenching adjacent to watercourses will be managed by:

- stockpiling excavated bank material at an appropriate distance from the watercourse or behind adequate stockpile berms
- stockpiling Acid Sulphate Soils (if present) separately, within a treatment area an appropriate distance from the watercourse or behind adequate stockpile berms in order to prevent acid leachate run-off
- installing sediment and erosion control measures (e.g. silt fences, sediment basins and erosion berms) on watercourse approaches and banks
- ceasing trenching on approaches to wet watercourses leaving hard trench plugs in place for the maximum period possible pending pipe laying.

Pipe laying in Watercourses

- The pipe section designated for the crossing shall be fabricated prior to trenching or directional drill completion to enable rapid installation.

- Watercourse crossings are generally scheduled for construction outside the wet season in order to minimise the risk of potential sedimentation. As outlined in the EMP, erosion and sediment controls are implemented on the banks of the watercourse, plus the ROW to ensure that the risk of any sedimentation of the watercourse is minimised to as low as reasonably practicable. This may include the installation of temporary sediment ponds. Typically, a trenched water course crossing will be completed within 7 to 10 days (including coffer dam construction and reinstatement after the pipe is laid).

Reinstatement of Watercourses

Appropriate stabilisation measures will be required on both the banks and bed of watercourses. Measures shall be determined on a site specific basis following consideration of local influencing factors such as stream hydrology, soil type, rainfall, vegetation regeneration potential, land use, etc.

Stabilisation measures shall be applied based on site specific requirements. These include:

- restoring watercourse banks to their original profiles
- respreading topsoil over the area from which it was removed and seeding areas of disturbance
- replacing or introducing a surface layer of cobbles, coarse gravel or rock over disturbed areas as rip-rap. Particular care shall be taken to ensure that the material is replaced on the river bed to a depth equivalent to the original conditions and so that it is not likely to act as a barrier to the passage of aquatic fauna
- stockpiled timber from pipeline construction clearing activities may also be utilised by spreading the timber randomly over the pipeline construction area leading down to the watercourse crossing
- sandbag, gabion or other means of scour protection may be applied and shall be placed to conform with existing natural contours, as appropriate, with topsoil respread over the sandbags or gabions preventing access to sites, e.g. fencing or barriers, to assist site recovery.

Additional erosion and sediment control measures may be applied, based on site specific requirements. These include:

- the application of terracing and surface water diversion berms along the top and at intermediate points down the bank slope. Run-off water discharge shall be used to stable (e.g. vegetated) areas or directed via sediment settling basins and not allowed direct into the watercourse

- the installation of silt and sediment fences on slopes to filter surface run-off water
- the reseeded or replanting of disturbed banks
- the application of stabilising materials such as, hydromulch, jute matting or other suitable geotextile materials
- Where ASS/PASS is identified, the application of appropriate management measures, such as the spreading of lime or other neutralising agents
- avoiding vehicle tracks up slopes on rehabilitation areas.

The following measures will be undertaken to minimise direct, indirect and downstream impacts to freshwater habitats and the biota (such as migratory birds) they support:

- The construction schedule will consider the increased risk of impact from construction during wet season and identify dry or low flow periods where impacts may be avoided or minimised.
- Flow diversion techniques will be used where flowing water is present during open cut crossings to minimise increase in turbidity
- Water required during construction will be sourced from existing allocations;
- The crossings, including vehicular and maintenance tracks, will typically be at right angles to the direction of water flow to minimise risk from scouring.
- If the watercourse contains a sandy substrate, consideration will be given to the use of rock stabilisation for addition to the channel and embankments to prevent scour
- Creek banks will be profiled and reinstated as near as practicable to their former profile following construction
- Where practicable, large riparian trees and rootstock will be retained for bank stabilisation;
- Clearing widths should be minimised in the beds of watercourses
- Buffers will to be established around environmentally sensitive areas and watercourses;
- Crossing sites selected to avoid:
 - Unstable banks
 - Deep pools
 - Rock basements or rock outcrops in the channel
 - Confluences with other channels;
- Seeding watercourse embankments with a fast-growing native grass (e.g. *Themeda australis*) or other suitable fast-growing species, or the use of hydro mulching (in the event of dry conditions) to aid in rehabilitation, where required is to be implemented

- Monitoring of the watercourses before, during and after construction shall be undertaken to ensure that rehabilitation works and stability of the watercourses is comparable to pre-construction conditions
- Avoid disrupting overland natural flow paths and, where avoidance is not practicable, maintain connectivity of flow in watercourses
- Pre-stripping and stockpiling of topsoil and bed material will be in accordance with the EMP
- The disturbance corridor for the bed, bank and approaches to watercourses will be the narrowest practicable for safe construction
- Training / induction of construction and maintenance crews will include environmental values associated with stream channels
- Where it is necessary to pump water around the watercourse crossing, the outlet water should not be directed onto the bank of the watercourse
- Minimum depth of cover of 1200 mm for watercourses
- Where an access track is required through a watercourse, this will generally be placed on the downstream side of the pipeline to minimise the potential for future erosion over the pipeline where practicable
- Watercourse crossings will be completed promptly and with due regard to the weather;
- No refuelling of plant and equipment will be undertaken within 50 m of watercourses;
- Install and maintain diversion drains to divert clean surface runoff water around production facilities and away from construction areas
- Implement an Erosion and Sediment Control Plan for the construction and operation period
- Locate soil stockpiles away from watercourses and wetlands to minimise potential for sediment runoff to enter the watercourse or wetland
- Site-specific management plans developed for permanent and semi-permanent watercourse crossings
- Ongoing inspection of watercourses during operation, and remedial action is to be initiated where required.

5 Conclusion on the likelihood of significant direct and indirect impacts

A search of the EPBC Protected Matters Search Tool for a 5 km buffer of the proposed pipeline route found the following MNES present;

- Five (5) Listed Threatened Ecological Communities
- 40 Listed Threatened Species¹
- 17 Listed Migratory Species
- One World Heritage Property – Great Barrier Reef
- One National Heritage Property – Great Barrier Reef
- Commonwealth Lands.

No direct or indirect impact on listed Migratory Species, Heritage Properties, Commonwealth lands or interruption to the use of these lands is expected and are therefore not included in this Preliminary Documentation Report.

Potential direct impacts to matters of MNES include:

- Loss of up to 7.3 ha of Natural grasslands of the Qld Central Highlands and the northern Fitzroy Basin (however, changes to the development area will avoid this potential impact)
- Introduction of pest and weed species
- Direct impacts to listed fauna species through vehicle strikes or trench-fall.

Potential indirect and downstream impacts to matters of MNES include indirect disturbance or loss of habitat areas and environmental values from:

- Removal of riparian vegetation
- Impacts to water quality from upstream erosion and sedimentation
- Impacts to water quality from upstream spills or leaks
- Leaching from excavated acid sulphate soils
- Rehabilitation failure
- Introduction of pest and weed species
- Changes to water flow regimes.

¹ *Paradelma orientalis* was removed from the *Environment Protection and Biodiversity Conservation Act 1999* list of threatened species on 15 May 2013.

Arrow undertook a review of the risks to MNES associated with the construction and operation of the proposed action. As presented in the report the risk that these threatening processes may result in indirect or downstream impacts is greatest during the construction period. During operational periods identified risks of indirect or downstream impacts are associated with weed control and rehabilitation failure. These risks are expected to be minor.

From the assessment of risks to MNES, Arrow has developed a number of measures to mitigate the risks and reduce the potential direct and indirect impact on the identified matters.

The controls, based on industry best practice, include:

- Commitment to the use of trenchless techniques (eg. HDD) for major watercourses: Isaac River, Fitzroy River, Inkerman Creek, Raglan Creek and Twelve Mile Creek.
- Only when the pipe is ready to be laid (i.e. following stringing, welding and testing), trenching will be undertaken. Watercourse crossings are generally scheduled for construction outside the wet season in order to minimise the risks associated with construction (e.g. sedimentation). Arrow has committed to implementing an erosion and sediment control plan for all creek and river crossings. Typically, in the case of an open trench crossing, one to three days would be required to trench a watercourse, lay the pipe and cover the pipe to return the bed to its original profile. Should flow diversion be required, the time taken to dam the watercourse (coffer dam), trench, lay and cover the pipe and remove the coffer dam is typically 7 to 10 days.
- Following construction, the banks of the watercourse are reinstated to their original profile to ensure no change in flow regimes.

It is concluded that, subject to the implementation of the management measures outlined in the EMP, no indirect and downstream impact on MNES would be expected from construction and operation of the ABP.

Arrow has avoided clearing Brigalow through realignment of the ROW. In addition, no clearing of Brigalow or Brigalow regrowth will be conducted outside the ROW.

The matters protected under the EPBC Act, likely to be impacted by the construction and operation of the Arrow Bowen Pipeline, have been identified as Listed communities and threatened species (sections 18 and 18A).

Arrow Energy has assessed the potential direct and indirect impacts on MNES including world and national heritage properties, Commonwealth lands, Threatened Ecological Communities and Threatened Species. The outcome of the analysis of potential impacts was the development of mitigation measures to avoid or minimise the potential for harm to these MNES. Construction and operation of the ABP is not expected to result in significant impacts on MNES.