



Plan

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Integrated Gas

CONDABRI GAS FIELD REHABILITATION PLAN LNG

This Rehabilitation Plan has been prepared to address State Government approval conditions for the Australia Pacific LNG Project relating to rehabilitation activities within the Condabri Gas Fields

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THE THREE WHATS

What can go wrong?
What could cause it to go
wrong?
What can I do to prevent it?

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1. Introduction

1.1 Project Description

Australia Pacific LNG Pty Limited (Australia Pacific LNG), a 37.5:37.5; 25 joint venture between Origin Energy Resource Limited (Origin), ConocoPhillips and Sinopec proposes to develop a world scale long-term coal seam gas (CSG) to liquefied natural gas (LNG) project in Queensland. The 30 year Project has the following objectives:

- Development of the Walloons gas fields in the Surat Basin in southern central Queensland with up to 10,000 CSG wells
- Operation and maintenance of approximately 530km main gas transmission pipeline ('the gas pipeline') to connect the Walloons gas fields with the LNG facility near Laird Point
- Operation and maintenance of an LNG facility near Laird Point on Curtis Island near Gladstone for production and export of approximately 18Mtpa of LNG.

Within the Condabri Development Area, it is proposed that production wells will be drilled and connected to the gathering system. Authorised petroleum activities to be carried out at under the EA may include development of:

- exploration, appraisal, and production wells
- water monitoring bores
- gas and water gathering networks
- waste transfer stations and pipelines
- irrigation water pipeline
- main pipeline
- central compressor stations
- water treatment facilities
- dams
- laydown and stockpile areas
- sewage treatment plants
- access tracks
- miscellaneous infrastructure
- workforce accommodation

All existing and proposed infrastructure is presented in revisions of the Condabri Plan of Operations.

2. Purpose

This Rehabilitation, Plan has been prepared to address rehabilitation activities within the Condabri Development Areas. The rehabilitation Plan has considered State Government approval conditions for the Australia Pacific LNG Project relating to rehabilitation activities within the Condabri Gas Fields. Specifically, this Plan has been developed to address the applicable approval conditions within the Condabri Environmental Authority, EPPG00853013 and Environmental Authorities EPPG00913213 (FRIP EA)/EPPG00904113 (Alfredson EA), EPPG03921216 (the Riley Block EA) and EPPG04017716 (TCIP).

A Remediation, Rehabilitation, Recovery and Monitoring Plan (RRRMP) was previously developed to address conditions 15 to 19 of EPBC approval 2009/4974 issued by the Department of Sustainability, Environment, Water, Population, and Communities (DSEWPoC) on 21 February 2011. As such, these conditions are not again addressed here.

Reinstatement and rehabilitation of disturbed areas is a regulatory requirement at the Federal and State level as part of environmental impact mitigation measures for the Australia Pacific LNG Project. Due to the different types of activities, disturbances and land uses across the Condabri Gas Fields, there is a need for a diversified approach to rehabilitation. Each site and each location will require

specific rehabilitation measures to ensure the significantly disturbed land is returned to the pre-disturbance condition or improved condition at the completion of the Project type or an agreed beneficial use.

2.1 Document Use

The function of this document is to identify the range of rehabilitation methods (Section 6) that may be required to successfully undertake shaping and rehabilitation of land to a pre-disturbance land use.

Sections 6 and 8 identify the methods to return land to a particular pre-disturbance land use (pasture, cropping, native vegetation), identifying the variety of rehabilitation types and objectives that are necessary to achieve the pre-disturbance land use and function. Section 8 identifies the success criteria to be used to identify if the rehabilitation has achieved the desired outcome and discusses the monitoring efforts that are required to prove that the rehabilitation outcome has been achieved for both the rehabilitation type and the disturbance.

2.2 Definitions, Abbreviations and Documents

2.2.1 Definitions and Abbreviations

In this document, the following definitions and abbreviations apply:

Table 1: Abbreviations

Term/Abbreviation	Meaning
ATP	Authority to Prospect
BAAM	Biodiversity Assessment and Mapping
CCS	Central Compressor Station
CSG	Coal seam gas
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management (currently EHP)
DOEE	Department of Energy and Environment (formerly DSEWPaC)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
EA	Environmental Authority
EHP	Department of Environment and Heritage Protection (Queensland) (formerly DERM)
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environment Management Register
EP Act	<i>Environmental Protection Act 1994</i> (Queensland)
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
ESA(s)	Category A, B and C Environmentally Sensitive Areas as mapped by EHP and defined in the Condabri Environmental Authority (Schedule L)
ESDAT	Environmental Data Management System
EVNT	A species listed as endangered, vulnerable or near threatened under the NC Act or threatened species under the EPBC Act.
FRIP	Fairymeadow Road Irrigation Project
FIC	Field Inspection Checklist
GCL	Geosynthetic clay liner
GIS	Global Information System
GQAL	Good Quality Agricultural Land as defined by <i>Planning Guidelines: the</i>

Term/Abbreviation	Meaning
	<i>Identification of Good Quality Agricultural Land (Queensland)</i>
GPS	Global Positioning System
HDPE	High density polyethylene
HSEMS	Health Safety Environment Management System
IECA	International Erosion Control Association
LNG	Liquefied Natural Gas
MDL	Minimum Disturbance Lease
MNES	Matters of National Environmental Significance listed under the EPBC Act
NC Act	<i>Nature Conservation Act 1992 (Queensland)</i>
NRM	Natural Resource Management
PL	Petroleum Lease
PLA	Petroleum Lease Application
PoO	Plan of Operations
PPL	Petroleum Pipeline Lease
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
RoW(s)	Right of Way(s)
RRRMP	Remediation, Rehabilitation, Recovery and Monitoring Program
SCL	Strategic Cropping Land
SEVT	Semi Evergreen Vine Thicket
SMU	Soil Management Unit
Stock Act	Stock Route Management Act 2002
TEC	Threatened Ecological Community listed under the EPBC Act
VM Act	<i>Vegetation Management Act (1999) (Queensland)</i>
WTF	Water Treatment Facility
WTS	Water Transfer Station

3. Scope

3.1 Geographical Extent

The Condabri Development Area (PPL185, PL265, PL266, PL267 ATP1178) is located approximately 37km west of Chinchilla in the Surat Basin in Queensland and covers an area of approximately 45,970ha. It occurs within the Western Downs Regional Council area.

The location of infrastructure is described in the Condabri Plan of Operations Q-4500-15-MP-1025. However, minor variations in the location of infrastructure are expected following the completion of pre-clearance surveys and the consideration of all project constraints.

3.2 Geography, Land Uses and Tenure

The Condabri Development Area is generally characterised by a flat to gently undulating landform with slopes in the order of 0 to 5%, with some concentrations of steeper slopes and terrain (approximately 10%) in the north and centre of the Development Area. In the flatter areas in the central and southern portions of the Development Area, flat to gently undulating clay plains with very shallow to deep Gilgai are common. Flat to gently undulating plains without Gilgai soils, derived from weathered sandstone, are also present in these areas.

A section of gently undulating plains to rises/low hills associated with the edges of the Brigalow plains is located across the centre of the Development Area. In the north of the development area, terrain is characterised by plateaus and low sandstone hills with lateritic scarps, with slopes of approximately 10% being common.

The Condamine River and Dogwood Creek traverse the Development Area, with Dogwood Creek located over flat to gently undulating sandy alluvial plains, and the Condamine River over river terraces and channels and associated alluvial plains.

The predominant land use over the development area is beef cattle production. Various forms of cropping are also practised in areas of more fertile soil and where the use of machinery is not constrained. Other land uses include forestry, nature conservation, resource extraction and urban activities.

Agricultural land use in the area is characterised by beef cattle production, dry-land cropping, irrigated cropping and intensive animal production. Crops are used for both stock fodder and as raw materials for a range of human food products. The predominant fodder crops are oats, forage sorghum and millet. The dominant human food crops are wheat, grain sorghum, chickpeas and sunflower seeds.

Table 2: Land Usage Condabri Development Area

Total area (km ²)	460
Land use category	% of Development Area
Grazing natural vegetation / minimal use	72.0
Grazing modified pasture	10.0
Forestry – production (State forest, which may be grazed)	2.9
Dry-land cropping / horticulture	5.3
Forestry - Plantation	<0.1
Irrigated cropping / horticulture	1.9
Intensive animal / plant production	0.2
Rural residential	0.5
Urban	5.8
Nature conservation / protected areas	1.2
Water	<0.1

Table note: Production forestry on state forest tenures - includes grazing activities as a co-use

The predominant land tenure in the Development Area is freehold. The percentage of the total area comprised by each land tenure category is summarised in Table 3.

Table 3: Land Tenure Condabri Development Area

Tenure category	% of Development Area
Freehold	82.6
Leasehold	10.2
State Forest	2.9
Roads, Easements, Watercourses	3.7
Unallocated State Land	0.1

(Source: Digital Cadastral Database, Queensland, Sept. 2009)

3.3 Stock Routes

The Stock Act establishes Queensland's stock route network. The primary purpose of this network is to provide for travelling stock, although other secondary uses may occur within a stock route. These other uses may include the short-term agistment of parts of the route, the establishment of watering agreements with private landholders and the construction and maintenance of stock route facilities. A road that is a stock route may be used as a transport corridor for vehicles or for communication and

utility infrastructure facilities, for example phone, power and gas lines. Stock routes within the Condabri Development Area are detailed in Table 4.

Impacts on stock routes will generally arise from the clearing of vegetation and ground disturbance associated with the laying of gas and water pipeline networks, or maintenance. No plant or water storage sites will be located within a stock route.

Table 4: Stock Routes within the Condabri Development Area

Stock route locations	Distance (km)
Leichhardt Highway	23.0
Warrego Highway	6.5
Pelham Road	10.6
Kogan/Condamine Road	9.0

3.4 Environmental Authority Conditions

Table 5: Details of where Condabri Environmental Authority EPPG00853013 H1-H17 EPPG00913213 Conditions E9-E11 and F4-F5, EPPG00904113 Conditions H1-H13, EPPG03921216 Condition B13-B15 and C45-C48 and EPPG04017716 Conditions E17-E19 and F4-F5 are addressed

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
H1 (EPPG00853013) A Rehabilitation Plan which has been certified by a suitably qualified person must be developed prior to carrying out of the petroleum activity(ies)	Entire document, refer to Appendices
H2 (EPPG00853013) The Rehabilitation Plan must include strategies for the determination of final land use(s) and rehabilitation goals and details of how rehabilitation objectives will be achieved. The Rehabilitation Plan must include: EPPG00913213 (E11) Backfilled, reinstated and revegetated pipeline trenches and right of way must be: (A) Vegetated with ground cover which is not a declared pest species, and which is established and self sustaining.	The process for determining final land use is outlined in Sections 6 and 8 The process for establishing specific rehabilitation goals is outlined in Section 6 native vegetation, grazing land and cropping land. Rehabilitation goals will be achieved by following the general rehabilitation process outlined in Section 6.
H2 (EPPG00853013) H3 (EPPG00904113) (a) A rehabilitation hierarchy for: (i) reinstating a native ecosystem as similar as possible to the original ecosystem as the preferred option; then (ii) establishing an alternative outcome with a higher environmental value than the previous land use; then (iii) reinstating the previous land use (e.g. grazing or cropping)	Outlined in Section 4.

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
<p>C45 (EPP03921216)</p> <p>A Rehabilitation Plan must be developed by a suitable qualified person and must include:</p> <ul style="list-style-type: none"> (a) rehabilitation goals; and (b) procedures to be undertaken for rehabilitation that will: <ul style="list-style-type: none"> i. achieve the conditions of (C19) and (C45) to (C48), inclusive, and; ii. provide for appropriate monitoring and maintenance 	<p>Outlined in Section 4.</p>
<p>H2 (EPPG00853013) H3 (EPPG00904113)</p> <p>(b) Methods to achieve rehabilitation goals including, but not necessarily being limited to:</p> <ul style="list-style-type: none"> (i) Establishing final land use(s) in consultation with affected landholder(s) and the administering authority; 	<p>The process for establishing final rehabilitation goals is outlined in Section 4 and 8</p>
<ul style="list-style-type: none"> (ii) Identifying suitable analogue sites to measure rehabilitation success that may either be the pre-disturbed area or another area that has equivalent values and characteristics as the intended final land use(s); and 	<p>Process for identification of analogue sites is outlined in Section 8</p>
<ul style="list-style-type: none"> (iii) For sites that are being reinstated to a land use other than a native ecosystem, the Rehabilitation Plan must identify any additional and relevant indicators to be measures at both the analogue and rehabilitation site(s) so as the assess progressive and final rehabilitation success for that land use; 	<p>Indicators and measures for analogue sites outlined in Section 8.</p>
<ul style="list-style-type: none"> (iv) For sites that are being reinstated to native ecosystems and the analogue site is the pre-disturbed site, the Rehabilitation Plan must include indicators that, as a minimum include those in condition A10 (h) and will be able to measure success against the progressive and final rehabilitation criteria in this environmental authority; 	<p>Indicators and measures for rehabilitation sites outlined in Section 8.</p>
<ul style="list-style-type: none"> (v) Identification of any land use constraints which have resulted from the petroleum activity(ies); 	<p>Land use constraints outlined in the introduction to Section 3.</p>
<ul style="list-style-type: none"> (vi) Residual pollution risks with strategies for managing and mitigating them; 	<p>Residual pollution risks addressed in Section 7.</p>
<ul style="list-style-type: none"> (vii) Landscape planning and landform design principles to achieve stable landforms including slope designs, erosion controls and drainage lines; 	<p>Landform design principles addressed in Section 6</p>
<ul style="list-style-type: none"> (viii) Integrating rehabilitated areas so they are compatible with the surrounding landscape, including linking rehabilitated areas of native vegetation with undisturbed native vegetation to provide larger areas and wildlife corridors where feasible; 	<p>Slope design and erosion and sediment control addressed in Section 6.</p>
<ul style="list-style-type: none"> (ix) Ensuring that significantly disturbed areas are rehabilitated progressively and that the progressive rehabilitation criteria are routinely measured: 	<p>Outlined in Section 6 and 8.</p>

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
(x) Site preparation such as re-profiling, reinstating surface drainage systems;	Re-profiling and surface drainage reinstatement addressed in Section 4.4.6.
(xi) Top soil management such as top soil handling and stockpiling to preserve soil fertility and biota, resspreading techniques, planned thickness, ripping, top soil treatments/amendments and mulching in consideration of analogue data;	Topsoil management addressed in Section 6.
(xii) Flora to be established, including required species diversity, abundance and composition and projective cover in consideration of analogue data;	Process for identification outlined in Section 6 and 8
(xiii) Plant propagation and/or supply methods including using seeds/spores of local provenance where feasible;	Seed supply addressed in Section 6. Propagation of tubestock addressed in Section 6.
(xiv) Establishment methods to maximise rehabilitation success such as seed treatments, seed spreading, timing of seeding to suit best local climatic conditions, hydro seeding, transplanting;	Methods for direct seeding addressed in Section 6 Transplanting addressed on Section 6.
(xv) Weed control	Weed control addressed in Section 6.
(xvi) Sourcing habitat structures for native fauna and installation methods in consideration of matching analogue data;	The installation of habitat structure is addressed in Section 6. The sourcing of habitat structures is addressed in Section 6.
(xvii) Ongoing maintenance program for rehabilitated areas; and	Ongoing maintenance addressed in Section 6
(xviii) Rehabilitation monitoring program as required by conditions (H13) and (H14) of this environmental authority; and EPPG00913213 (F5) Monitoring of performance indicators must be carried out on rehabilitation activities until final acceptance criteria in condition (F4) have been met for the rehabilitated area	Rehabilitation monitoring program outlined in Section 8
(c) Timeframes for commencing rehabilitation of significantly disturbed areas not required for the ongoing conduct of the petroleum activity(ies), not greater than three (3) months for the rehabilitation of buried pipelines and not greater than nine (9) months for any other disturbed area. EPPG00913213 (E9) Pipeline trenches must be back filled and topsoils reinstated within 3 months after pipe laying. EPPG00913213 (E10) Reinstatement and revegetation of the pipeline right of way must commence within 6 months after completion of petroleum activities for the purpose of pipeline construction.	Outlined in Section 4 and 5 also referred in Section 8.
H2 (EPPG00853013) H3 (EPPG00904113) The holder of this environmental authority must implement the Rehabilitation Plan.	Not referenced

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
<p>F4 (EPPG00913213) only</p> <p>After decommissioning, all significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be rehabilitated to meet the following final acceptance criteria:</p> <ul style="list-style-type: none"> (a) Any contaminated land (e.g.: contaminated soils) is remediated and rehabilitated (b) Rehabilitation is undertaken in a manner such that any actual or potential acid sulphate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the <i>Instructions for the treatment and management of acid sulphate soils</i> (2001) (c) For land that is not being cultivated by the landholder: <ul style="list-style-type: none"> (i) Ground cover, that is not a declared pest species is established and self-sustaining; (ii) Vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and (d) For land that is to be cultivated by the landholder, establish final land use(s) that is acceptable to the affected landholder(s) and the administering authority 	<ul style="list-style-type: none"> (a) Residual pollution risks addressed in Section 7 (b) Soil management addressed in Section 6 (c) Process for identification outlined in Section 6 (d) Success criteria located in Section 8.
<p>H4 (EPPG00853013), H4 (EPPG00904113)</p> <p>Pipelines trenches must be backfilled immediately after pipe laying and rehabilitated as soon as practicable but not longer than three (3) months after completion.</p> <p>E9 (EPPG00913213), B13 (EPPG03921216), E17 (EPPG04017716)</p> <p>Pipelines trenches must be backfilled and topsoils reinstated within 3 months after pipe laying.</p>	<p>Outlined in Section 4 and 5. Rehabilitation Methods discussed in Section 6.</p>
<p>H5 (EPPG00853013)</p> <p>During backfilling of pipeline trenches, soils must be replaced in accordance with the soil management plan required by condition (D22).</p> <p>H5 (EPPG00904113)</p> <p>During backfilling of pipeline trenches, soils must be replaced so that the top two (2) soil horizons are consistent with the soil horizons of the immediately surrounding area</p>	<p>Rehabilitation methods discussed in Section 6</p>
<p>H6 (EPPG00853013) H6 (EPPG00904113)</p> <p>Backfilled and rehabilitated pipeline trenches must:</p> <ul style="list-style-type: none"> (a) be a stable landform; (b) exhibit no subsidence or erosion gullies for the life of the operational pipeline; and (c) be re-profiled to a level consistent with surrounding soils; and (d) be re-profiled to original contours and established drainage lines; and (e) be visually consistent with the surround land features; and. (f) be vegetated with groundcover as a minimum to ensure that erosion is minimised. 	<p>Rehabilitation methods discussed in Section 6. Success criteria and monitoring discussed in Section 8.</p>

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
<p>H6 (EPPG00853013) only (g) upon final decommissioning of pipeline the rehabilitation conditions as per Condition H10 to H12 must be met.</p> <p>E11 (EPPG00913213)</p> <p>Backfilled and rehabilitated pipeline trenches must:</p> <ul style="list-style-type: none"> (a) be a stable landform; (b) re-profiled to a level consistent with surrounding soils; (c) re-profiled to original contours and established drainage lines; and (d) vegetated with groundcover which is not a declared pest species, and which is established and self sustaining. <p>B15 (EPPG03921216)</p> <p>Backfilled and rehabilitated pipeline trenches must:</p> <ul style="list-style-type: none"> (a) be a stable landform; (b) re-profiled to a level consistent with surrounding soils; (c) re-profiled to original contours and established drainage lines; and (d) either; <ul style="list-style-type: none"> i. Growing a ground cover that is not a declared pest species or; ii. Stabilised with an alternative soil stabilisation methodology that achieves effective stabilisation. 	
<p>H7 (EPPG00853013)</p> <p>Progressive rehabilitation of significantly disturbed land caused by the carrying out of the petroleum activity(ies) (other than constructing pipelines) which is not required for the ongoing conduct of the petroleum activity(ies) must commence as soon as practicable, but not longer than nine (9) months following the completion of any construction or operational works associated with the petroleum activity(ies).</p> <p>E10 (EPPG00913213) E18 (EPPG04017716) B14 (EPPG03921216)</p> <p>Reinstatement and revegetation of the pipeline right of way must commence within 6 months after completion of petroleum activities for the purpose of pipeline construction.</p>	<p>Outlined in Section 4 and 5. Rehabilitation methods discussed in Section 6. Success criteria and monitoring discussed in Section 8.</p>
<p>H8 (EPPG00853013) H7 (EPPG00904113) Progressive rehabilitation of significantly disturbed land must be undertaken in accordance with the Schedule of Disturbance submitted to the administering authority as part of the financial assurance calculations.</p>	<p>As prescribed in the point of time revision of the Condabri Plan of Operations</p>
<p>H9 (EPPG00853013) H8 (EPPG00904113) Progressive rehabilitation of significantly disturbed land caused by the carrying out of the petroleum activity(ies) must:</p> <ul style="list-style-type: none"> (a) remediate any contaminated land (e.g. contaminated soils, decommissioned dams containing salt); (b) reshape all significantly disturbed land to a stable landform; (c) reprofile all significantly disturbed land to original contours; (d) on all significantly disturbed land: (i) re-establish surface drainage lines; 	<p>Outlined (a-e) in Sections 6-8.</p>

<p>EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716</p>	
EA Condition	Section of Rehabilitation Plan where addressed
<p>(ii) reinstate the top layer of the soil profile; (iii) establish groundcover to ensure that erosion is minimised; (iv) establish vegetation of floristic species composition found in analogue sites; (e) undertake rehabilitation in a manner such that any actual and potential acid sulfate soils in or on the site are either not disturbed, or submerged, or are treated to prevent and / or minimise environmental harm.</p>	
<p>H10 (EPPG00853013) only All significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be rehabilitated to meet the following final acceptance criteria: (a) For all land use(s): (i) all significantly disturbed land is reinstated to the pre-disturbed land use unless otherwise agreed to between the holder of this environmental authority, the landholder and the administering authority; (ii) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class; (iii) the landform is safe for humans and fauna; (iv) the landform is stable with no subsidence or erosion gullies for at least five (5) years; (v) a minimum of 80% percent foliage cover of analogue sites is maintained in the rehabilitated sites for at least three (3) years; (vi) a minimum of 80% of the flora species diversity in analogue sites is maintained in the rehabilitated sites for at least three (3) years; (vii) a minimum equal density of habitat structures, including but not limited to litter cover, coarse woody debris and hollow logs, as that in analogue sites; (viii) erosion is minimised with appropriate sediment traps and erosion control measures installed as determined by a suitably qualified person; (ix) the water quality of any residual void or water bodies constructed by the petroleum activity(ies) meets criteria for subsequent uses and does not have potential to cause environmental harm; (x) there is no ongoing contamination to waters; (xi) there is no ongoing contamination to groundwater from dams or monocells (demonstrated via groundwater monitoring and leak detection monitoring systems); and (xii) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies). (b) Additional requirements for sites that are being reinstated to native ecosystems: (I) each vegetation community must be re-established so that each of the following rehabilitation parameters are maintained for at least three (3) years:</p>	<p>Outlined in Sections 6-8.</p>

<p>EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716</p>	
EA Condition	Section of Rehabilitation Plan where addressed
<p>(ii) the rehabilitated site shows distinct and progressive re-establishment of the various strata which characterise the vegetation community in the analogue site;</p> <p>(iii) all dominant species within each strata are re-established at densities equivalent to that of the analogue site;</p> <p>(iv) each vegetation community must be rehabilitated and maintained until it can be demonstrated that it is resilient and self-sustaining; and</p> <p>(v) percent organic litter cover, count and density of hollow bearing logs and nest boxes (as replacement for trees with hollows >10cm diameter) and coarse woody debris (total length of logs > 10 cm diameter per hectare and number of logs > 10cm per hectare) have been installed at numbers and densities no lower than the analogue site.</p>	
<p>H9 (EPPG00904113) only</p> <p>All significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be rehabilitated to meet the following final acceptance criteria:</p> <p>(a) For all land use(s):</p> <p>(i) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;</p> <p>(ii) the landform is safe for humans and fauna;</p> <p>(iii) the landform is stable with no subsidence or erosion gullies for at least three (3) years;</p> <p>(iv) all significantly disturbed land is reinstated so that the distribution of vegetation communities represents the analogue site and which are not weed species.</p> <p>(v) there is no ongoing contamination to waters;</p> <p>(vi) there is no ongoing contamination to groundwater from dams or monocells (demonstrated via groundwater monitoring and leak detection monitoring systems); and</p> <p>(vii) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies).</p> <p>(b) Additional requirements for sites that are being reinstated to native ecosystems:</p> <p>(i) each vegetation community must be re-established so that each of the following rehabilitation parameters are maintained for at least three (3) years:</p> <p>(a) the rehabilitated site shows distinct and progressive re-establishment of the various strata which characterise the vegetation community in the analogue site;</p> <p>(b) all dominant species within each strata are re-established at densities equivalent to that of the analogue site;</p> <p>(c) notwithstanding (H9) (b) (i) (a), a minimum of 70% species richness and species diversity is observed when compared to the relevant analogue site;</p> <p>(d) a minimum 50% foliage cover is observed when compared to the relevant analogue sites;</p>	<p>Outlined in Sections 6-8.</p>

<p>EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716</p>	
EA Condition	Section of Rehabilitation Plan where addressed
<p>(e) each vegetation community must be rehabilitated and maintained until it can be demonstrated that it is resilient and self-sustaining; and</p> <p>(f) percent organic litter cover, count and density of hollow bearing logs and nest boxes (as replacement for trees with hollows >10cm diameter) and coarse woody debris (total length of logs > 10 cm diameter per hectare and number of logs > 10cm per hectare) have been installed at numbers and densities no lower than the analogue site.</p>	
<p>C46 (EPPG03921216) only</p> <p>Significantly disturbed areas that are no longer required for the ongoing petroleum activities, must be rehabilitated within twelve (12) months (unless under exceptional circumstances in the area rehabilitated (e.g.: a flood event) prevents this timeframe being met) and be maintained to meet the following final acceptance criteria:</p> <ul style="list-style-type: none"> (a) Contaminated land resulting from petroleum activities is remediated and rehabilitated (b) The areas are <ul style="list-style-type: none"> (i) Non-polluting (ii) A stable landform (iii) Re-profiled to contours consistent with the surrounding land form (c) Surface drainage lines are re-established (d) Topsoil is reinstated, and; (e) Either; <ul style="list-style-type: none"> (i) Groundcover, that is not a declared species, is growing; or (ii) An alternative soil stabilisation methodology that achieves stabilisation is implemented and maintained. 	<p>Outlined in Sections 6-8.</p>
<p>C47 (EPPG03921216) only</p> <p>All significantly disturbed areas caused by petroleum activities which are not being or intended to be utilised by the landholder or overlapping tenure holder, must be rehabilitated to meet the following final acceptance criteria measured either against the highest ecological value adjacent land use or the pre-disturbed land use:</p> <ul style="list-style-type: none"> a) Greater than or equal to 70%of native vegetation cover species richness b) Greater than or equal to the total per cent of ground cover c) Less than or equal to the percent species richness of declared plant pest species; and d) Where the adjacent land use contains, or the predisturbed land use contained, one or more regional ecosystem(s), then at least one regional ecosystem from the same broad vegetation group, and with the equivalent biodiversity status or a biodiversity status with a higher conservation value as any of the regional ecosystem(s) in either the adjacent land or pre-disturbed land, must be present. 	<p>Outlined in Sections 6-8.</p>

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
<p>C48 (EPPG03921216) only</p> <p>Where significant disturbance to land has occurred in an environmentally sensitive area, the following final rehabilitation criteria as measured against the pre-disturbance biodiversity values assessment (required by conditions (B6) and (B7) must be met:</p> <ul style="list-style-type: none"> a) Greater than or equal to 70% of native vegetation cover species richness b) Greater than or equal to the total per cent of ground cover c) Less than or equal to the percent species richness of declared plant pest species d) Greater than or equal to 50% of organic litter cover e) Greater than or equal to 50% of total density of coarse woody material; and f) All predominant species in the ecologically dominant layer, that define the pre-disturbance regional ecosystem(s) are present. 	<p>Outlined in Sections 6-8.</p>
<p>H11 (EPPG00853013) H1 (EPPG00904113)</p> <p>Notwithstanding condition (H10), all buried pipelines must be decommissioned in accordance with the requirements of Australian Standard 2885, as amended from time to time.</p>	<p>As per Pipeline Suspension or Abandonment Procedure (CDN/ID 3676093).</p>
<p>H12 (EPPG00853013) H2 (EPPG00904113)</p> <p>Despite condition (H10), any dam may be decommissioned for a beneficial use provided that it:</p> <ul style="list-style-type: none"> (a) no longer contains contaminants that will migrate in to the environment; and (b) the administering authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the petroleum activity(ies). 	<p>As per Procedure for Decommissioning and Rehabilitation of Dams (CDN/ID 3674842).</p>
<p>F4 (EPPG04017716)</p> <p>After decommissioning, all significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be rehabilitated to meet the following final acceptance criteria:</p> <ul style="list-style-type: none"> (a) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated; (b) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the Instructions for the treatment and management of acid sulfate soils (2001); (c) for land that is not being cultivated by the landholder: <ul style="list-style-type: none"> (i) groundcover, that is not a declared pest species is established and self-sustaining; (ii) vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and (d) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within three months of petroleum activities being completed. 	<p>Sections 6 and 8 including As per Pipeline Suspension or Abandonment Procedure (CDN/ID 3676093).</p>

EPPG00853013/EPPG00913213/EPPG00904113/ EPPG03921216/ EPPG04017716	
EA Condition	Section of Rehabilitation Plan where addressed
<p>H13 (EPPG00853013) A Rehabilitation Monitoring Program which has been certified by a suitably qualified person must be developed by 11 January 2013.</p> <p>H10 (EPPG00904113) A Rehabilitation Monitoring Program which has been certified by a suitably qualified person must be developed by 15 July 2013.</p>	<p>Outlined in Section 8 and refer to Appendix A and B.</p>
<p>H14 (EPPG00853013) H11 (EPPG00904113) The Rehabilitation Monitoring Program must include, but not necessarily be limited to:</p> <p>(a) methods to measure subsidence and erosion rates at rehabilitated buried transmission pipeline corridors and buried flow lines;</p> <p>(b) monitoring of indicators identified in the Rehabilitation Plan at analogue sites to measure progressive and final rehabilitation success relevant to the final land use(s); and</p> <p>(c) frequency and seasonality of monitoring analogue sites and rehabilitated areas to assess rehabilitation success; and</p> <p>(d) identification of the experimental design for analysing analogue and rehabilitated site data including statistical methods of analyses.</p>	<p>Monitoring is outlined in Section 8.</p>
<p>H15 (EPPG00853013) The holder of this environmental authority must implement the Rehabilitation Monitoring Program.</p>	<p>Not referenced</p>
<p>H16 (EPPG00853013) Final acceptance criteria are deemed to be met when monitoring of rehabilitated areas demonstrate compliance with the requirements of condition (H10) for five (5) consecutive years.</p> <p>H13 (EPPG00904113) Final acceptance criteria are deemed to be met when monitoring of rehabilitated areas demonstrate compliance with the requirements of condition (H9) for three (3) consecutive years.</p> <p>F5 (EPPG00913213/EPPG04017716) Monitoring of performance indicators must be carried out on rehabilitation activities until final acceptance criteria in condition (F4) have been met for the rehabilitated area.</p>	<p>Outlined in Section 8.</p>
<p>H17 (EPPG00853013) Regular maintenance and at least yearly monitoring of rehabilitated areas must take place to measure compliance with condition (H6) and (H9).</p> <p>H12 (EPPG00904113) Regular maintenance and at least yearly monitoring of rehabilitated areas must take place to measure compliance with condition (H6) and (H8).</p>	<p>Outlined in Section 8.</p>

3.5 Coordinator General's Conditions

The Co-ordinator General's conditions for the Australia Pacific LNG Gas Fields were provided in November 2010 within the Coordinator General's Report on the EIS (The Coordinator General 2010). Table 6 shows where these conditions are addressed within the Rehabilitation Plan.

Table 6: Details of where the Co-ordinator General's Conditions are Addressed

Requirement Source	Requirement	Section of Rehabilitation Plan where addressed
Conditions that apply to the whole project – gas fields, gas transmission pipelines and LNG facility Part 1 General	Condition 6, Stock routes The parts of the stock route network disturbed or affected by the works must be rehabilitated upon completion of the project to a state that is safe for travelling stock and drovers, and the travelling public, and is consistent with the area's pre-disturbance state unless otherwise agreed by EHP and the local government.	Section 3.3
Conditions that apply to the Gas Fields Part 2 Environmental	Condition 15 Borrow Pits Prior to the construction of borrow pits the proponent must undertake an assessment of the environmental values, potential impacts, mitigation measures for the sitting, construction, operation, decommissioning and rehabilitation of borrow pits required for petroleum activities and will provide this assessment to the administering authority.	Section 6 and 8.
Conditions that apply to the Gas Fields Part 2 Environmental	Condition 18 Dam decommissioning Decommissioned dams are to be rehabilitated and the landform must be reinstated such that it will not function as a dam and will be stable and sustainable for the foreseeable future (unless otherwise negotiated with landholders). A minimum depth of 0.25m topsoil must be placed over decommissioned storage dams to ensure an adequate vegetal cover can be established.	As per Procedure for Decommissioning and Rehabilitation of Dams (CDN/ID 3674842).
Conditions that apply to the Gas Fields Part 1 Environmental	Recommendation, Strategic Cropping Land It is recommended that the proponent should have regard to SCL policy framework published in August 2012 by DERM when determining gas field development locations	Section 6
Conditions that apply to the Gas Transmission Line Part 2, General Conditions	Condition 9, GQAL The proponent must include provisions in the EM Plan for the gas pipeline, ensuring that, on land identified as being good quality agricultural land (GQAL), The pipeline contractor must: a. on completion of construction, remove temporary access tracks b. on completion of construction, lightly rip disturbed areas, replace topsoil and return the surface to a land use condition that serves the preconstruction use	Section 6

Requirement Source	Requirement	Section of Rehabilitation Plan where addressed
	<p>c. on completion of construction, implement land management and erosion control measures</p> <p>d. on land with GQAL class A, B or C1, bury the pipeline to at least 0.9m below finished land surface, or greater if deep ripping is a normal practice.</p>	

4. Rehabilitation Objectives

4.1 Rehabilitation hierarchy

The overall goal of rehabilitating significantly disturbed areas no longer required for petroleum activities is to achieve the pre-disturbance land use unless otherwise agreed with the landholder or other overlapping tenure holder and approved by the State government administering authority.

It must be noted that all significant disturbances are to be rehabilitated in a way that will meet the final acceptance criteria when compared to the adjacent land use or pre-disturbance land use unless there is an alternative intended land use to be utilised by the landholder or an overlapping tenure holder. The alternative option away from final acceptance criteria does not apply if the disturbance is a category A, B or C environmentally significant area where specific rehabilitation objectives are to be achieved.

Final rehabilitation goals will be determined according to the following hierarchy, in order of preference and prior condition:

1. Reinstatement and rehabilitation of the pre-disturbance land use.
 - o Where existing pre-disturbance; reinstating a self-sustaining and progressive native ecosystem with predominant species of the ecologically dominant layer where disturbance occurred within an environmentally sensitive area.
2. Establishing an alternative outcome for a higher environmental value than the prior land use
3. Reinstatement of the prior land use such as for the purpose of grazing or cropping
4. Establishing a beneficial use where land is intended to be utilised by the landholder or an overlapping tenure holder.

4.2 Reinstatement Objectives

Reinstatement refers to restoration and stabilisation of land following project disturbance or maintenance activities to establish a stable landform suitable for the operational phase of the project. Reinstatement is a precursor to rehabilitation. Reinstatement is evaluated using criteria for progressive rehabilitation defined in the gas field Environmental Authorities.

5. Rehabilitation Planning

5.1 Reinstatement Planning

A site specific reinstatement plan will be developed by a suitably qualified person addressing site specific measures to be implemented as part of the construction works to establish a stable area for the operational land use and support achieving the final rehabilitation objectives.

The site specific rehabilitation plan must include the following:

- Reinstatement and/or rehabilitation land use in accordance with the rehabilitation hierarchy
- revegetation species and methods
- land stabilisation and soil amelioration requirements
- details of any site specific measures that may differ from the general methods described in this plan (RRRMP), including justification demonstrating an equivalent or better environmental outcome.

5.2 Final Rehabilitation Planning

A site specific decommissioning and rehabilitation plan will be developed by a suitably qualified person addressing the site specific measures to be implemented as a part of the decommissioning and rehabilitation works to maintain/establish the desired operational land use. Attention to the environmental requirements are:

- Exploring opportunities for reuse or retention of infrastructure for a beneficial use
- Removing surface and underground infrastructure that may impede final rehabilitation
- Decontaminating and rehabilitating surroundings, and as required from disturbance;
- Stabilise the landform and revegetate with consideration to the rehabilitation objective (e.g. pasture, cropping or native vegetation establishment).

6. Rehabilitation Methods

This section outlines general rehabilitation methods. Note that for many infrastructure types, certain areas will be required to remain treeless during operations or may be intended to be utilised by the landholder or an overlapping tenure holder. These areas will be reinstated after construction. It is important to recognise the rehabilitation objectives described in Section 6 are applied only where they can be achieved for operating infrastructure or decommissioned infrastructure. Reinstatement may involve the return of soil, mulch, re-seeding with pasture grasses or native grasses and ground cover species or reliance upon natural regeneration. In some situations final reprofiling of the land form may not take place during reinstatement. An example of this is a well pad where a cut and fill is required to create a level surface for infrastructure, operational and maintenance requirements, and the well pad is required to remain open and free of shrubs and trees during operations. Final rehabilitation, may include return of woody native vegetation, where required in an environmentally sensitive area, this will take place once infrastructure is no longer required and is decommissioned. Any decommissioning plan for infrastructure should be informed by all environmental requirements.

6.1 Vegetation Clearing and Mulching

During vegetation clearing measures will be undertaken to harvest timber resources, minimise loss of habitat places and reserve mulch for use in reinstatement. The following requirements must be adhered to for the clearing, mulching and stockpiling of vegetation:

- Prior to commencing clearing in timbered areas, consult with the landholder to agree any timber harvesting requirements such as setting aside felled logs for landowner use
- Prior to and during clearing mature trees and trees with habitat values (e.g. hollows or potential nesting sites) will be identified by a suitably qualified person and marked in the field and where possible clearing will be avoided,.
- Habitat features including logs, hollow bearing trees and rocks, will be identified by a suitably qualified person and retained for habitat recreation through relocation adjacent to the disturbed area
- Woody vegetation (other than habitat features and useable timber requested to be reserved by the landowner) will be mulched for use in rehabilitation unless otherwise authorised by the Origin Environmental Manager
- Mulch and cleared vegetation must be stockpiled to facilitate spreading or salvaging within the disturbance area in a location that facilitates later use in rehabilitation. Gaps will be left in stockpiles to avoid impeding vehicle, stock or wildlife movements,
- Mulch stockpiles will not be wider than 10m and higher than 2m, where practical and managed to reduce fire fuel loads at the base.
- Mulch stockpiles are to be stored separately to subsoils and kept free of waste and biosecurity restricted matters
- Mulch should be stockpiled separately from topsoil where practicable and necessary to preserve topsoil, however some mixing of mulch with topsoil is acceptable
- mulch stockpiles must be at least 10m from the top bank of the low flow channel of drainage features and not placed where they could obstruct flow or be washed away in a flow event

- for non-linear and longer term mulch storages an appropriate fire break will be established
- mulch stockpile locations retained post rehabilitation are to be recorded via GPS point.

6.2 Soil management

Effective management of soil is essential to successful reinstatement and rehabilitation. Management of topsoil and subsoil will be undertaken in accordance with the Soil Assessment and Management Plans (SAMP) for the gas fields. The gas fields SAMPs include requirements for site planning, soil identification, topsoil preservation, management of subsoils, stockpiling and amelioration.

6.3 Landform re-establishment

6.3.1 Backfilling

The following actions will be implemented in backfilling of trenches and reinstatement of excavations, although site specific requirements, will be implemented where necessary in precedence to those outlined below:

- pipeline trenches, bell holes and other open excavations will be backfilled as soon as practicable after pipe laying.
- pipeline trenches must be rehabilitated as soon as practicable but not longer than three (3) months after completion
- backfilled excavations should be suitably compacted to prevent subsidence. Notwithstanding this, compaction must not impede rehabilitation and establishment of vegetation
- excavated subsoils will be used for backfilling
- backfill materials (i.e. padding sand and subsoil) will not be contaminated with general rubbish or any foreign material
- subsoils will not be used as a surface capping layer
- certified clean, weed and disease free backfill material may be used where required. Clearance certificates and analysis reports must be kept on record, and;
- topsoil will not be used for backfill

6.3.2 Reinstating land form

Land form reinstatement involves surface contouring to create a stable land formation consistent with the surrounding land. This ensures water flow over the surface is in cohesion with the surrounding landscape and minimises the risk of potential gully erosion. General mitigation measures will be implemented to minimise potential impacts. These measures are:

- in areas of site levelling works, proposed formation levels will be set to reduce the need for significant cut and fill areas
- in areas where access tracks have been constructed the landform will be re-profiled to establish a landform consistent with the surrounding landscape and ensure it is in a stable condition
- restore all disturbed areas to a stable landform consistent with surrounding areas
- complete surface contouring prior to replacement of topsoil
- re-establish and stabilise surface drainage lines to prevent ongoing erosion
- restore all drainage lines to pre-disturbance bed level, channel width and longitudinal gradient, and;
- restore drainage line banks to stable profile which is as close to pre-disturbance conditions as practicable.

6.3.3 Compaction relief

Ripping assists with binding of the soil layers, increases retention time of water on the slope, aids water infiltration into the soil increasing the opportunity of seed germination success and reduces the volume and velocity of runoff generated from the slope. This will be undertaken along contours where practicable, particularly on heavily trafficked areas such as temporary access tracks, laydowns, working sides of RoWs camps and hardstands and other areas compacted by construction activities. Some points to inform ripping as a reinstatement practice are:

- compaction relief of subsoil will occur in all disturbed areas where subsoil has been compacted and prior to topsoil replacement and where the area will not undergo compaction from ongoing operational activity. Where compaction of soil may occur due to ongoing operational use (e.g. tracks), compaction relief should occur following decommissioning (not construction reinstatement)
- compaction relief will utilise appropriate equipment designed for soil compaction alleviation ensuring soil inversion and exposure of subsoils is avoided, compaction is effectively relieved to the target depth, while avoiding forming large clods and smearing of soils
- ripping depth must be determined by a suitably qualified person and take in consideration the following aspects:
 - depth and magnitude of compaction effects through assessment activities undertaken on the site
 - depth of underground assets and restriction limits that may apply for protection of these assets
 - Establish target compaction relief outcomes with regard to analogue or adjacent sites undisturbed by project activities
- ripping of the soil must take place when the soil is at friable consistency, check soil moisture prior to undertaking ripping. Identify the optimum window for conducting compaction relief. Refer to long-term climatic data and/or real time soil moisture measurements to facilitate decision-making
- where practicable rip along contours. On areas running down slope lift tines every 50m for 5m
- ripping will be excluded from under the drip lines of retained vegetation to avoid impacts on the root systems of adjacent vegetation, and;
- Establish access controls to prevent re-compaction of treated areas.

6.3.4 Fertiliser

Fertilisers will be applied as required on the basis of site soil assessment and based on land use and vegetation type. Fertiliser requirements will be determined by suitably qualified person, taking in consideration, soil characteristics, land use and vegetation required to re-establish. Fertiliser will be used on areas of agricultural land and operational areas, however no fertiliser is required to be used in areas where native vegetation regeneration is the rehabilitation outcome.

Fertiliser inputs will include the following:

- Fertilisers may be applied in reinstatement of pasture and grassed areas to stimulate revegetation
- fertiliser application in agricultural areas should take into account landowner requirements
- fertilisers will not be used for native vegetation establishment, as most native plants have adapted to low natural nutrient soil conditions
- fertilisers with a supply of sulphur (S) should not be used where soil conditions indicate a pH of <5, as this will contribute to further lowering the pH, and;
- fertiliser types and application rates are to be informed from soil analysis information and applied as instructed on packaging or advice guide.

6.4 Vegetation Respreding

Large felled native vegetation, mulch and other fauna habitat elements (large surface rocks and felled tree trunks) will be reserved where practical and placed adjacent to the edge of the disturbance area with consideration to site characteristics, site maintenance requirements and personnel safety. Stockpiled vegetation, mulch and other fauna habitat elements will be spread or stored after any seeding task as follows:

- mulched material will be evenly spread over the disturbed area to assist in the distribution of seed stock and provide erosion protection
- stockpiled vegetation may be stored or placed in a way on disturbance that does not impede operational maintenance or access considering site characteristics i.e. along the disturbance boundary linearly
- mulch will be spread once seeding and/or planting has been completed
- mulch layer thickness should generally not exceed 50mm and 70% coverage, unless authorised by an Environmental Advisor

- all reserved habitat features, vegetation and mulch will be used in any final rehabilitation task as to the durability over time of the natural product
- to prevent weed and soil pathogen spread and assist with appropriate revegetation and soil micro-organism recovery, topsoil, mulch and habitat elements will be sourced from salvage specific to that site
- where mulch has to be brought in from other source approval must be obtained from the Environment Advisor and be accompanied by a biosecurity hygiene declaration from the supplier
- felled vegetation will not be burnt unless directed by the regulatory authority, and;
- habitat features including logs, hollow bearing trees and rocks, will be identified prior to or during clearing by a suitably qualified person and retained for habitat recreation through relocation adjacent to the disturbed area.

6.5 Erosion and Sediment Control

Erosion and sediment control requirements relevant to reinstatement and rehabilitation will be carried out in accordance with the gas field Erosion and Sediment Control Plan (ESCP) and site specific ESCP that may be developed for a specific site. It must be noted that ESCP will be amended to suit site requirements and ESC installations are subject to the progress of land rehabilitation and land uses i.e. cropping over disturbances.

6.6 Revegetation & Rehabilitation types

Revegetation of a disturbance area involves the use of natural regeneration, direct seeding, propagates or tubestock to support an area achieving a similar pre-clearance native vegetation species richness, regional ecosystem species richness, cropping or pasture system. The following techniques will be discussed as methods for vegetating disturbance areas. Not all methods will be utilised at a given disturbance as each outcome to the disturbance type, infrastructure operations, maintenance inputs and final or existing land utilisation outcome remain different.

6.6.1 Reinstatement – Pasture and Ground Cover Establishment

Areas disturbed will be sown with appropriate pasture or native species seed mix sourced from reputable local seed suppliers and as agreed with the landholder to establish a stable vegetative cover. From time to time seeding for pasture re-establishment will be omitted if abundant seed is available in the topsoil seedbank and disturbance window is limited for topsoil storage. The use of a sterile cover crop seed may be added to the seed mix used in reinstatement, unless otherwise requested by the landholder. Seeding will generally occur directly following topsoil replacement and reinstatement to facilitate progressive rehabilitation. This task will be undertaken irrespective of whether the site is to undergo reinstatement or final rehabilitation.

Seeding methods to be employed can include:

- a direct seeding method can be undertaken using a spreader attached to the rear of a tractor which delivers seed onto the soil and suitably buries seed
- a drill seeding method that applies and presses the seed to a specified depth (harrowing will not be required for drill seeding)
- hand distribution where seed is broadcast. This method is mostly employed where steep slopes are present and impractical for machinery application methods, and;
- hydro-seeding and hydro-mulching or equivalent product may be used on steep slopes to encourage more rapid revegetation and, therefore, stabilisation of the rehabilitated area.
- Seeding method application will be determined by site specific constraints. Seeding is to take place after surface preparations, but before final harrowing. For direct seeding and hand distribution harrowing is undertaken after seeding, the seed is covered with a small layer of soil to assist in the germination process and protect from predation such as avian and insect seed forages. Rehabilitation crews should assess each site on a case by case basis to ensure the most practical and cost effective (to desired outcome) application method is supplied to a disturbance area, according to the topography and level of risk involved if machinery is utilised.

6.7 Direct Seeding of Native Species for Final Rehabilitation

The selection of species to be used in the rehabilitation process where native vegetation is the final land use objective may be guided by the pre-clearance vegetation assessment, adjoining vegetation assessment or determined from analogue site surveys as outlined in Section 8. Species selection may be guided by soil conditions, micro-climate and aspect of the new land form. Information held within

analogue site surveys and associated reports may support the volume of seed and species required to be sourced which will require careful planning to ensure supplies are available and seed can be sourced from reputable local and selected seed suppliers that provide local provenance seed stock. Seeding may take place at seasonal times or times of suitable climatic conditions that are best suited to germination success.

Seeding is to be undertaken as soon as practicable after the topsoil has been spread or prepared and stable profile restored, but before spreading mulch or other habitat features. Sowing may take advantage of the most appropriate season for germination and establishment of seedlings (i.e. immediately before the commencement of the wet season) as manual watering will not be undertaken. A suitable seeding method will be undertaken following the techniques outlined in Section 6 above.

Direct seeding with sterile cover crop or grasses may be undertaken in areas where the rapid establishment of vegetation cover is required (e.g. watercourse crossings, steep slopes and other potential high erosion areas).

Where practicable or identified as necessary for recovery fencing off from stock may be required, depending on adjacent land use and stakeholder inputs to facilitate revegetation and regrowth until site stability is established. Fencing where required will be constructed to the Origin Energy specifications, given landholder input where MNES are being rehabilitated such as TECs, or EVNT plant species that are site specifically prone to detrimental impacts through grazing.

6.7.1 Natural Regeneration

Trees and shrubs will be allowed to regenerate naturally on reinstated areas not required to be kept tree free for the purpose of operation and maintenance, where establishment of native vegetation is the final land use objective. This practice will contribute to reducing barriers to fauna movement, especially to ground-dwelling fauna. Natural regeneration is the preferred method of revegetation in areas where native vegetation was cleared. To assist natural revegetation the following will be undertaken:

- Where topsoil does not require removal, root stock will be left in the ground where practicable to facilitate rapid regrowth
- preserve and utilise the existing seedbank in the topsoil to regenerate native vegetation
- use mulch to establish temporary ground cover for erosion protection of disturbed areas
- within 100m of downslope drainage lines and where the availability of mulch is not sufficient to provide 70% groundcover at 50mm thickness, natural regeneration must be supplemented with direct seeding of a sterile cover crop species during reinstatement.
- conduct rehabilitation monitoring to evaluate revegetation success and undertake direct seeding with native species if natural regeneration is unsuccessful when attempting EA final acceptance criteria.

6.7.2 Cropping areas

In areas of prior or intended (by the landholder) cultivation; seeding is not a required task. If a landholder has an intended land use of cultivation, where infrastructure has been installed then the approach to sow a cover crop or not to sow the disturbance area must be confirmed with the landholder.

6.7.3 Tubestock Planting

There will be certain situations where tubestock planting will be required as a primary response or a secondary response to establish the required vegetation cover and diversity, such as where species unsuited to direct seeding must be established, including communities such as Brigalow and some SEVT species. Tubestock planting may also be required to return plant species of conservation significance including MNES and State listed ENVT species and these may only be practically returned via direct planting. Requirements for tubestock planting are as follows:

- species to be selected for planting will be sourced from local suppliers wherever possible to meet volume requirements, necessary planning and preparations will be required to ensure the desired species and volume can be supplied
- tubestock will be planted in the early wet season (December – February) to take advantage of rainfall as no manual watering program will be conducted beyond the initial planting. Some ecosystems, such as SEVT revegetation will require supplementary watering during establishment as the diverse species are mostly very slow growing
- spacing will be determined according to the species, but will typically be 2m apart for most tree species

- tubestock will be watered immediately following planting
- moisture retention products (water crystals) at the time of planting may be utilised to support the establishment of plants
- where available mulch will be placed around tubestock plants, but should not touch the stems, and;
- fencing will be required following planting to prevent native and livestock browsing damage.

Engagement with tubestock suppliers will identify the requirement to deliver local provenance tubestock and supply will be guided by the list of key species developed for the relevant Regional Ecosystems, in consultation with land holders, in regard to adjoining vegetation community species and based on BioCondition reference data from analogue site survey (surveys outlined in Section 8) in certain situations, mentioned above, where tubestock planting will be required. Identified quantities of tubestock will be sourced from reputable local and specialist nursery stock suppliers. The collection, storage and sourcing of seed for tubestock propagation will be via the engagement of reputable local seed suppliers and specialist seed suppliers by contracted local and specialist nursery stock suppliers.

6.7.4 Seed Collection

To meet the requirements for direct seeding for diverse native species for final rehabilitation, seed will be sourced from native species, with preference for seed of species adapted to local conditions. It is anticipated seed collection will be affected by:

- climatic conditions such as rainfall and prolonged periods of drought affecting flowering and seed set
- natural predation of avian and insect fauna
- distribution of diverse seed types and sizes
- quantity of seed set and management of harvesting quantities within acceptable limits for natural reproduction of native species, and;
- supplier quality, quantity, accessibility and volume of seed and types available for harvesting.

Seed purchasing will be guided by several information sources such as the list of key species developed for the relevant Regional Ecosystems (found in Appendix A), and for pasture species, in consultation with land holders, adjoining vegetation community species and based on BioCondition reference data. Seed harvesting where identified as necessary will be conducted on request to suitably skilled contracted services and as required to the availability of target species to accommodate the commercial quantities of seed necessary as advised by lists of key species developed for the relevant Regional Ecosystems, and for pasture species, in consultation with land holders and based on BioCondition reference data. Where engaged reputable local seed suppliers and specialist seed suppliers will be suitably permitted to undertake collection and will be required to collect commercial quantities of seed to meet this demand. Seed the particular species assemblage will be required to be tested by the supplier and evidence of viability provided before sowing to ensure there will be adequate germination rates.

6.7.5 Remnant vegetation requirements

6.7.5.1 Disturbance limits

Ecological communities existing within the Gas Fields include listed ecological communities under the EPBC Act (Commonwealth), and Endangered, Of Concern, Least Concern Regional Ecosystems under the *Vegetation Management Act 1999* (VM Act) (Queensland).

Threatened Ecological Communities (TECs) (EPBC status) present within the Gas Fields at the time of granting the 2009/4974 approval area include Brigalow, SEVT and Weeping Myall open woodland. No clearing of Weeping Myall woodland is permitted under the EPBC Approval 2009/4974, however clearing limits for Brigalow woodland and SEVT exist and are permitted. TECs present in the Gas fields but listed after 2009/4974 include Coolibah – Black Box Woodlands, no clearing limits are specified in this approval and rehabilitation requirements are not referred in Section 6.9, however the rehabilitation requirements remain for this community upon decommissioning actions as discussed Section 6.9.

Threatened Ecological Communities (TECs) (EPBC status) not identified within the gas fields include:

- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland TEC
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native Grassland

As the above threatened ecological communities have not been identified within the gas fields development area and clearing of Weeping Myall woodland is not permitted under the EPBC Approval 2009/4974, these TECs have not been addressed within this plan. If the above ecological communities are detected Australia Pacific LNG will develop and submit to DoEE for approval rehabilitation techniques for these TECs.

Where there are direct impacts on TECs and State significant values, offsets will be provided in accordance with the State approved and Federally recognized Environmental Offsets Strategy (Q-LNG01-15-EA-0021). The strategy is based on the following policies at the time of writing the Environmental Offsets Strategy:

- Queensland Government *Environmental Offset Policy* (QGEOP)
- Draft Policy Statement: Use of environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999.

The Queensland Department of Environment and Resource Management Policy for Vegetation Management Offsets VEG/2006/2888 – version 2.4 (21/10/2009) will not be referred in this plan. Environmental protection aspects of petroleum extraction are regulated under the *Environmental Protection Act* 1994 (Qld) and this policy does not apply to the Project.

More specifically Threatened Ecological Community Management Plans (TECMP) (Q-LNG01-15-MP-0114) for the TECs had been approved in 2011 and amendments remain for Minister approval. TECMP has made specific references to the recovery of these threatened ecological communities and include measures on avoidance, mitigation and management practices to minimise impacts and aid recovery.

6.7.5.2 Rehabilitation objective

The overall objective for the rehabilitation of native vegetation listed as a TEC under the EPBC Act is to achieve site remediation and rehabilitation of impacted areas to promote progressive recovery of affected environments. This practically involves maintaining a reinstated landform with a protective vegetative cover during Operations. The aim of the rehabilitation following decommissioning infrastructure for disturbed remnant vegetation is to restore native ground cover richness, total percent ground cover, species richness, organic litter cover, coarse woody material and dominant species in the ecologically dominant layer of the Regional Ecosystem to greater than or equal to the percentages stated in Environmental Authority conditions to the specific tenure.

The process of developing specific goals for individual sites for the species to be established, the required species diversity, the required abundance and composition and the required foliage cover will involve the following:

- undertake environmental surveys for areas to identify as determined by risk, the correct Regional Ecosystem (RE) of the site to be disturbed
- utilise BioCondition reference site survey data at analogue sites to develop criteria for each RE for diversity, composition, stem density, and foliage cover
- set criteria for each RE based on the findings of the BioCondition reference site surveys and;
- monitor rehabilitation against set goals for the RE.

6.7.5.3 Rehabilitation techniques

There are slight differences in the techniques for revegetation of the dominant species within each RE, based on the species specific natural regeneration processes in response to fire and other natural or manmade disturbances. General soil handling and site preparation techniques during construction and operational maintenance will be similar irrespective of the broad vegetation group. The reinstatement of landforms and stability through operations will also be similar irrespective of infrastructure type. Regeneration will be supported where suitable to the operation of the infrastructure.

Post decommissioning of infrastructure the general technique will involve the support of regeneration and where required revegetation, for remnant vegetation. Revegetation as required will utilise direct seeding or for certain situations tubestock planting may also be required, such as where species fail to regenerate or species are unsuited to direct seeding, e.g. Brigalow and some SEVT species.

The seed mix for areas of remnant vegetation will be determined by the vegetation composition of the Regional Ecosystem as determined by analogue surveys or informed by assessment of the adjacent highest conservation value Regional Ecosystem. Consideration will be given to a seed mix including native grass species that will provide good protection from erosion in the short term but also allow shrubs and tree seedlings to establish successfully post decommissioning. Where it is necessary to keep areas free of trees during project operations (such as along pipeline ROWs and well lease pads)

a seed mix containing native grasses and ground cover species or species applicable to the existing grass cover of the disturbance area or natural regeneration of ground cover will be used. In areas where vegetation is removed, but the soil and roots are not extensively disturbed, natural regeneration only will be relied upon for revegetation.

Each ecosystem contains a range of species with different germination and seedling establishment requirements. Some plants germinate from the topsoil without any action required. Some species only require seed to be collected and sown across the site (direct seeding), while others require some seed treatment, e.g. exposure to smoke, prior to sowing. Determining the germination and seedling establishment requirements of a range of appropriate plant species will be required when undertaking final revegetation efforts post decommissioning.

6.8 Rehabilitation Types

6.8.1 Native Vegetation

6.8.1.1 Regional Ecosystems and High Value Regrowth

A short description and the conservation status of REs within the Condabri Development Area are provided in Table 7. In reference to the REs referred in Table 7, Table 8 outlines the revegetation guidelines to re-establish these communities.

On ground field mapping of the Condabri Development Area for the Australia Pacific LNG EIS (Australia Pacific LNG, 2010) identified the presence of three REs not previously mapped within the Condabri development area; REs 11.3.27b, 11.4.13 and 11.5.20. Not all REs detected within the Condabri Development Area will necessarily be disturbed by gas field development.

Table 7: Regional Ecosystems (REs) within the Condabri Development Area

RE	Management Status ²			Short RE description (REDD ³)
	EPBC Act	VM Act	EP Act (Biodiversity status)	
11.3.1	E	E	E	Brigalow (<i>Acacia harpophylla</i>) and/or Belah (<i>Casuarina cristata</i>) open forest on alluvial plains
11.3.2	E ¹	OC	OC	Poplar Box (<i>Eucalyptus populnea</i>) woodland on alluvial plains
11.3.3		OC	OC	Coolibah (<i>Eucalyptus coolabah</i>) woodland on alluvial plains
11.3.4		OC	OC	Queensland Blue Gum (<i>Eucalyptus tereticornis</i>) and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains
11.3.14		LC	NC	<i>Eucalyptus</i> spp., <i>Angophora</i> spp., <i>Callitris</i> spp. woodland on alluvial plains on sandy soils
11.3.18		LC	NC	<i>Eucalyptus populnea</i> , <i>Callitris glaucophylla</i> , <i>Allocasuarina luehmannii</i> shrubby woodland on alluvium
11.3.25		LC	OC	Queensland Blue Gum (<i>Eucalyptus tereticornis</i>) or River Red Gum (<i>E. camaldulensis</i>) woodland fringing drainage lines

RE	Management Status ²			Short RE description (REDD ³)
	EPBC Act	VM Act	EP Act (Biodiversity status)	
11.3.27b		LC	OC	Lacustrine wetland (e.g. lake). Vegetation ranges from open water +/- aquatics and emergent such as <i>Potamogeton crispus</i> , <i>Myriophyllum verrucosum</i> , <i>Chara</i> spp., <i>Nitella</i> spp, <i>Nymphaea violacea</i> , <i>Ottelia ovalifolia</i> , <i>Nymphoides indica</i> , <i>N. crenata</i> , <i>Potamogeton tricaratus</i> , <i>Cyperus difformis</i> , <i>Vallisneria spiralis</i> and <i>Hydrilla verticillata</i> . Often with fringing woodland, commonly <i>Eucalyptus camaldulensis</i> or <i>E. coolabah</i> but also a wide range of other species including <i>Eucalyptus platyphylla</i> , <i>E. tereticornis</i> , <i>Melaleuca</i> spp., <i>Acacia holosericea</i> or other <i>Acacia</i> spp. Occurs on billabongs no longer connected to the channel flow.
11.4.3	E	E	E	Brigalow (<i>Acacia harpophylla</i>) and/or Belah (<i>Casuarina cristata</i>) shrubby open forest on Cainozoic clay plains
11.4.10	E	E	E	Poplar box (<i>Eucalyptus populnea</i>) or narrow-leaved box (<i>E. pilligaensis</i>), brigalow (<i>Acacia harpophylla</i>), belah (<i>Casuarina cristata</i>) open forest to woodland on margins of Cainozoic clay plains
11.4.12		E	E	Poplar box (<i>Eucalyptus populnea</i>) woodland on Cainozoic clay plains
11.4.13		LC	E	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic clay plains
11.5.1		LC	NC	Narrow-leaved Red Ironbark (<i>Eucalyptus crebra</i>), White Cypress Pine (<i>Callitris glaucophylla</i>), Smooth-barked Apple (<i>Angophora leiocarpa</i>), Buloke (<i>Allocasuarina luehmannii</i>) woodland on Cainozoic sand plains and remnant surfaces
11.5.1a		LC	NC	Narrow-leaved red ironbark (<i>Eucalyptus crebra</i>), white cypress pine (<i>Callitris glaucophylla</i>), black cypress p (<i>C. endlicheri</i>), Baradine red gum (<i>E. chloroclada</i>), smooth-barked apple (<i>Angophora leiocarpa</i>) on Cainozoic sand plains and remnant surfaces on deep sands
11.5.4		LC	NC	Narrow-leaved Red Ironbark (<i>Eucalyptus crebra</i>), White Cypress Pine (<i>Callitris glaucophylla</i>), Black Cypress Pine (<i>C. endlicheri</i>), Baradine Red Gum (<i>E. chloroclada</i>), Smooth-barked Apple (<i>Angophora leiocarpa</i>) on Cainozoic sand plains and remnant surfaces on deep sands
11.5.20		LC	NC	Gum-topped box (<i>Eucalyptus moluccana</i>) and/or inland grey box (<i>E. macrocarpa</i>) / narrow-leaved box (<i>E. pilligaensis</i>) ± narrow-leaved red ironbark (<i>Eucalyptus crebra</i>) woodland on Cainozoic sand plains
11.7.1		LC	OC	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. macrocarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust
11.7.2		LC	NC	<i>Acacia</i> spp. woodland on lateritic duricrust in scarp retreat zone

RE	Management Status ²			Short RE description (REDD ³)
	EPBC Act	VM Act	EP Act (Biodiversity status)	
11.7.4		LC	NC	Gum-topped Ironbark (<i>Eucalyptus decorticans</i>) and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., Budgeroo (<i>Lysicarpus angustifolius</i>) on lateritic duricrust
11.7.5		LC	NC	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.7.7		LC	NC	Tall Dusky-leaved Ironbark (<i>E. fibrosa</i> ssp. <i>nubila</i>) ± <i>Corymbia</i> spp. ± <i>Eucalyptus</i> spp. On lateritic duricrust
11.9.5	E	E	E	Brigalow (<i>Acacia harpophylla</i>) and/or Belah (<i>Casuarina cristata</i>) open forest on fine-grained sedimentary rocks

1 Only where Weeping Myall *Acacia pendula* occurs.

2 Where: **E** = Endangered, **OC** = Of Concern, **LC** = Least Concern, **NC** = No Concern at Present, * = Threshold (at risk of becoming **OC**). 'EP Act' status is based on the 'Biodiversity Status' prescribed on the State Government Regional Ecosystem Description Database v6.

3 REDD = DERMs Regional Ecosystem Description Database latest available

Table 8: Regional Ecosystem Descriptions and Revegetation Guidelines

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
Brigalow					
11.3.1 <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on alluvial plains	Associated with Cainozoic alluvial plains which may be occasionally flooded. Landforms range from level to very gently sloping plains, alluvial flats, drainage floors, back-swamps and abandoned channels. Associated soils are predominantly deep to very deep cracking clays, sometimes with gilgai or texture contrast soils with sandy surface (particularly where <i>Eucalyptus populnea</i> is present)	Direct seed <i>Casuarina cristata</i> , <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> Direct seed in lower density emergent <i>Eucalyptus</i> spp. such as <i>E. coolabah</i> , <i>E. largiflorens</i> , <i>E. populnea</i> , <i>E. orgadophila</i> and <i>E. woollsiana</i>	Sow fresh seed of <i>Casuarina cristata</i> Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment	Optional - Plant <i>Acacia harpophylla</i> at 2 m spacings if regrowth is unlikely due to extensive root disturbance	Allow for regeneration.
11.4.3 <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open-forest on Cainozoic clay plains	On Cainozoic clay plains with cracking clay soils which are often with a weak gilgai micro relief. The plains may be flat to gently undulating. Soils are often cracking clay which are usually deep to very deep, often self-mulching and sometimes with surface stone. Texture contrast soils and other clays may also be present in places	Direct seed <i>Casuarina cristata</i> , <i>Eremophila mitchellii</i> and <i>Geijera parviflora</i> . Direct seed in lower density <i>Eucalyptus</i> spp. such as <i>E. orgadophila</i> , <i>E. populnea</i> , <i>E. microcarpa</i> , <i>Eucalyptus woollsiana</i> , <i>E. cambageana</i> and <i>E. thozetiana</i>	Sow fresh seed of <i>Casuarina cristata</i> Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment	Optional - Plant <i>Acacia harpophylla</i> at 2 m spacing if regrowth is unlikely due to extensive root disturbance. Scattered plantings of <i>Brachychiton rupestris</i> , <i>Citrus glauca</i> , <i>Carissa ovata</i> , <i>Alectryon diversifolius</i> and <i>Melaleuca bracteata</i> (in low-lying areas)	Allow for regeneration.
11.4.10 <i>Eucalyptus populnea</i> or <i>E. woollsiana</i> , <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> open-forest to woodland on margins of Cainozoic clay plains	On deep, texture contrast soils	Direct seed <i>Eucalyptus populnea</i> , <i>E. woollsiana</i> , <i>E. molluccana</i> or <i>E. pillagaensis</i> and <i>Casuarina cristata</i> Direct seed in lower density <i>E. molluccana</i> or <i>E. microcarpa</i> and <i>Geijera parvifolia</i>	Sow fresh seed of <i>Casuarina cristata</i> . Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment. Remove flesh of seed from <i>Geijera parviflora</i> prior to sowing	Optional - Plant <i>Acacia harpophylla</i> at 2 m spacings if regrowth is unlikely due to extensive root disturbance	Allow for regeneration.

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.7.1 Brigalow (<i>Acacia harpophylla</i>) and/or belah (<i>Casuarina cristata</i>) and mountain yapunyah (<i>Eucalyptus thozetiana</i>) or inland grey box (<i>E. microcarp</i>) woodland on lower scarp slopes on lateritic duricrust	Occurs on the slopes and scarps of rocky residual ranges with Cainozoic lateritic duricrust. The soils are shallow, gravelly, acidic loams and clays on the upper slopes, with deep (70-105 cm deep), uniform, brown clays with surface gravel on the lower slopes.	Direct seeding of <i>Eucalyptus thozetiana</i> as dominant canopy species. Also sow at low rates if locally present <i>E. macrocarpa</i> and <i>E. cambageana</i> Direct seed <i>Casuarina cristata</i> Direct seed in lower density <i>Geijera parviflora</i> , and if locally present <i>Eremophila mitchellii</i> at low densities <i>Acacia catenulata</i> and <i>A. microsperma</i> may be present towards crests and can be direct seeded.	Sow fresh seed of Eucalyptus species and <i>Casuarina cristata</i> Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing	Optional - Plant <i>Acacia harpophylla</i> at 2 m spacing if regrowth is unlikely due to extensive root disturbance <i>Cadellia pentastylis</i> is sometimes present and may be locally dominant. Plant emergent species such as <i>Cadellia pentastylis</i> on better quality sites where locally present.	Ground layer is sparse and usually dominated by forbs (allow to recover through regeneration).
11.9.5 <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on fine-grained sedimentary rocks	The topography includes gently undulating plains, valley floors and undulating foot slopes and rarely on low hills. The soils are generally deep texture-contrast and cracking clays. The cracking clays are usually black or grey to brown or reddish-brown in colour, often self-mulching and sometimes with gilgai microrelief in flatter areas. Some texture contrast soils are shallow to only moderately deep	Direct seed <i>Casuarina cristata</i> Direct seed in lower density <i>Geijera parviflora</i> , <i>Eremophila mitchellii</i>	Sow fresh seed of <i>Casuarina cristata</i> Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing	Optional - Plant <i>Acacia harpophylla</i> at 2 m spacing if regrowth is unlikely due to extensive root disturbance Plant <i>Melaleuca bracteata</i> along watercourses	Allow for regeneration.

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
Rock pavements					
11.7.5 Shrubland on natural scalds on deeply weathered coarse- grained sedimentary rocks	On shallow soils often associated with natural scalds on Cainozoic lateritic duricrusts and sometimes lithosols derived from quartzose sandstone	Direct seeding of <i>Calytrix</i> spp., <i>Hakea</i> spp., <i>Kunzea</i> spp., <i>Micromyrtus</i> spp., <i>Acacia</i> spp., <i>Melaleuca</i> spp. Direct seeding in lower density <i>Eucalyptus exserta</i> , <i>E. panda</i> , <i>E. curtisii</i> , <i>Corymbia</i> <i>trachyphloia</i> and <i>Acacia blakei</i>	For most shrub species seeds should be collected by cutting off outer branches containing woody capsules, allowing to dry and collecting seeds as they are released. This seed should be applied through direct seeding Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment. Soak seed of <i>Acacia</i> spp. in hot water before sowing	Optional - Undertake supplementary tubestock planting of species with very small seed such as species of <i>Calytrix</i> spp., <i>Kunzea</i> spp., <i>Micromyrtus</i> spp. and <i>Melaleuca</i> spp.	Allow for regeneration.
Lancewood and Bendee dominated woodlands					
11.7.2 <i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	On scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts. The soils are shallow to very shallow lithosols with surface stone and boulders. The vegetation is often growing in pockets of shallow lithosol soil between bare rock	Direct seeding of <i>Acacia</i> <i>shirleyi</i> , <i>A. catenulata</i> Direct seeding in a lower density of <i>Acacia. rhodoxylon</i> , <i>A. burrowii</i> , <i>A. sparsiflora</i> , <i>A.</i> <i>crassa</i> , <i>A. blakei</i> , <i>Eucalyptus</i> <i>thozetiana</i> , <i>E. crebra</i> , <i>E.</i> <i>fibrosa</i> , <i>E. decorticans</i> , <i>E.</i> <i>exserta</i>	Soak seed of <i>Acacia</i> spp. in hot water, or scarify prior to seeding. Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment	Optional - Undertake tubestock planting of understorey species including <i>Acalypha</i> <i>eremorum</i> , <i>Croton</i> <i>phebaloides</i> and <i>Carissa ovata</i>	Allow for regeneration or where seed is available direct seeding at low density of grasses including <i>Aristida caput-</i> <i>medusae</i> , <i>Paspalidium</i> <i>rarum</i> , <i>Thyridolepis</i> <i>mitchelliana</i> , <i>Urochloa</i> <i>foliosa</i> and occasionally forbs such as <i>Sida</i> <i>filiformis</i>

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
Callitris dominated or co-dominated woodlands					
11.3.14 <i>Eucalyptus</i> spp., <i>Angophora</i> spp., <i>Callitris</i> spp. woodland on alluvial plains	On Cainozoic alluvial plains with sandy soils	Direct seeding of <i>Angophora floribunda</i> , <i>A. leiocarpa</i> , <i>Eucalyptus tereticornis</i> and <i>E. chloroclada</i> , <i>Callitris glaucophylla</i> . Direct seeding in lower density of <i>Allocasuarina luehmannii</i> , <i>Xylomelum cunninghamianum</i> , <i>Acacia neriifolia</i> , <i>Callitris endlicheri</i> , <i>Acacia conferta</i> , <i>Jacksonia scoparia</i> and <i>Leptospermum polygalifolium</i>	Sow seed of <i>Angophora</i> spp., <i>Allocasuarina</i> spp. and <i>Eucalyptus</i> spp. fresh with no pre-treatment. Soak seed of <i>Acacia neriifolia</i> , <i>Acacia conferta</i> and <i>Jacksonia scoparia</i> in hot water before sowing. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing	Optional - Undertake tubestock planting of <i>Leptospermum polygalifolium</i> , <i>Leucopogon muticus</i> and <i>Melaleuca thymifolia</i> . Additional tubestock planting of trees along riverbanks may be required	Allow for regeneration or where seed is available direct seeding with grasses including <i>Bothriochloa decipiens</i> , <i>Enteropogon acicularis</i> , <i>Aristida ramosa</i> and <i>Tripogon loliiformis</i>

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.5.4 <i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>C. endlicheri</i> , <i>E. chloroclada</i> , <i>Angophora leiocarpa</i> on Cainozoic sand plains/remnant surfaces with deep sands	On Cainozoic alluvial plains with sandy soils	Direct seeding of <i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>E. chloroclada</i> , <i>Angophora leiocarpa</i> , <i>Corymbia clarksoniana</i> , <i>Allocasuarina luehmannii</i> , <i>A. inophloia</i> and <i>Callitris endlicheri</i> Direct seeding in lower density of <i>A. floribunda</i> and <i>E. Rhombica</i> .	Sow seed of <i>Angophora</i> spp., <i>Allocasuarina</i> spp., <i>Corymbia</i> spp. and <i>Eucalyptus</i> spp. fresh with no pre-treatment Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing	Unlikely to be required	Allow for regeneration or where seed is available direct seeding with grasses including <i>Bothriochloa decipiens</i> , <i>Enteropogon acicularis</i> , <i>Aristida ramosa</i> and <i>Tripogon</i>
Eucalypt-dominated or co-dominated woodlands					
11.3.2 <i>Eucalyptus populnea</i> woodland on alluvial plains	Occurs on Cainozoic alluvial plains with variable soil types including texture contrast, deep uniform clays, massive earths and sometimes cracking clays	Direct seed <i>E. populnea</i> , <i>E. melanophloia</i> , <i>Geijera parviflora</i> , <i>Eremophila mitchellii</i> , <i>Acacia salicina</i> , <i>Acacia pendula</i> , <i>Lysiphyllum</i> spp., <i>Cassia brewsteri</i> , <i>Callitris glaucophylla</i> and <i>Acacia excelsa</i>	Sow seed of <i>Eucalyptus</i> spp. fresh with no pre-treatment. Soak seed of <i>Acacia salicina</i> , <i>Acacia pendula</i> , <i>A. excelsa</i> , <i>Lysiphyllum</i> spp., and <i>Cassia brewsteri</i> in hot water before sowing Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing	Not likely to be required	Allow for regeneration or where seed is available direct seeding with grasses including <i>Bothriochloa decipiens</i> , <i>Enteropogon acicularis</i> , <i>Aristida ramosa</i> and <i>Tripogon loliiformis</i>
11.3.3 <i>Eucalyptus coolabah</i> woodland on alluvial plains	Occurs on Cainozoic alluvial plains or levees with clay or sometimes texture contrast soils	Direct sow <i>Eucalyptus coolabah</i> Direct sow <i>E. populnea</i> at lower density Direct sow <i>Acacia pendula</i> and <i>A. cambagei</i>	Sow fresh seed of <i>Eucalyptus</i> spp. with no treatment Soak seed of <i>Acacia</i> spp. before sowing	Optional - Undertake tubestock planting of <i>Melaleuca bracteata</i> , <i>Alectryon oleifolius</i> and <i>Terminalia oblongata</i> if present	Allow for regeneration or where seed is available direct seeding with grasses including <i>Bothriochloa decipiens</i> , <i>Enteropogon acicularis</i> , <i>Aristida ramosa</i> and <i>Tripogon loliiformis</i>

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains	Occurs on variety of soils, including deep cracking clays, medium to fine textured soils and deep texture-contrast soils	Direct sow <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> Where present also sow <i>Corymbia tessellaris</i> , <i>E. coolabah</i> , <i>C. clarksoniana</i> , <i>E. populnea</i> or <i>E. brownii</i> , <i>E. melanophloia</i> , <i>E. platyphylla</i> or <i>Angophora floribunda</i>	Sow fresh seed of <i>Eucalyptus</i> spp. <i>Corymbia</i> spp. and <i>Angophora</i> spp. with no treatment	Not likely to be required	Allow for regeneration or where seed is available direct seeding with perennial grasses including <i>Bothriochloa</i> <i>bladonii</i> subsp. <i>bladonii</i> , <i>Aristida</i> spp., <i>Heteropogon contortus</i> , <i>Dichanthium</i> spp. and <i>Themeda triandra</i>
11.3.18 <i>Eucalyptus populnea</i> , <i>Callitris glaucophylla</i> , <i>Allocasuarina</i> <i>luehmannii</i> shrubby woodland on alluvium	Occurs on levees, higher alluvial plains and terraces associated with drainage lines. The soils are mainly deep, uniform red sands, or deep, texture contrast soils with a sandy, thick surface horizon overlying neutral, blocky to massive subsoil's. Small areas occur on red massive earths and alluvial soils	Direct sow <i>Eucalyptus populnea</i> and/or <i>E. melanophloia</i> depending on local dominance Also sow <i>Callitris glaucophylla</i> , <i>E. crebra</i> , <i>E. chloroclada</i> , <i>Angophora leiocarpa</i> and <i>Allocasuarina luehmannii</i> <i>Geijera parviflora</i> and/or <i>Eremophila mitchellii</i> should be sown depending on local presence	Sow seed of <i>Angophora</i> spp., <i>Allocasuarina</i> spp. <i>Eucalyptus</i> spp. fresh with no pre-treatment Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing	Optional - Undertake tubestock planting of <i>Alstonia constricta</i>	Allow for regeneration or where seed is available direct seeding with perennial grasses such as <i>Bothriochloa</i> <i>decipiens</i> , <i>Enteropogon</i> <i>acicularis</i> , <i>Triraphis</i> <i>mollis</i> , <i>Eragrostis</i> <i>lacunaria</i> and <i>Aristida</i> spp.

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. These are usually moderately deep to deep, soft or firm, acid, neutral or alkaline brown sands, loams or black cracking or non-cracking clays and may be sodic at depth	Direct seed <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> . Sow other tree species such as <i>Casuarina cunninghamiana</i> , <i>E. coolabah</i> , <i>Melaleuca bracteata</i> , <i>Melaleuca viminalis</i> and <i>Angophora floribunda</i> at lower densities unless locally dominant. Sow <i>Acacia salicina</i> , <i>A. stenophylla</i> or <i>Lysiphyllum carronii</i>	Sow fresh seed of <i>Eucalyptus</i> spp, <i>Angophora</i> spp. and <i>Casuarina</i> spp. with no treatment. Soak seed of <i>Acacia</i> spp. and <i>Lysiphyllum carronii</i> before sowing	Undertake tubestock planting of all tree species on stream banks. Optional - Undertake tubestock planting of <i>Melaleuca</i> spp. Consider transplanting of <i>Lomandra longifolia</i> and <i>Cyperus</i> spp.	Allow for regeneration or where seed is available direct seeding with perennial grasses, sedges or forbs such as <i>Imperata cylindrica</i> , <i>Bothriochloa bladhii</i> , <i>B. ewartiana</i> , <i>Chrysopogon fallax</i> , <i>Cyperus dactyloides</i> , <i>C. difformis</i> , <i>C. exaltatus</i> , <i>C. gracilis</i> , <i>C. iria</i> , <i>C. rigidellus</i> , <i>C. victoriensis</i> , <i>Dichanthium sericeum</i> , <i>Leptochloa digitata</i> , <i>Lomandra longifolia</i> or <i>Panicum</i> spp.
11.4.12 <i>Eucalyptus populnea</i> woodland on Cainozoic clay plains	Occurs on eroding edge of Tertiary clay plains	Seed mix should be dominated by <i>E. populnea</i>	Sow seed of <i>Eucalyptus populnea</i> fresh with no pre-treatment	Not likely to be required	Allow for regeneration or where seed is available direct seeding with <i>Aristida</i> spp. <i>Enteropogon</i> spp. and <i>Eragrostis</i> spp. and some forbs with moderate density
11.4.13 <i>Eucalyptus orgadophila</i> open woodland on Cainozoic clay plains	The soils are often derived from weathered basalt	Seed mix should be dominated by <i>E. orgadophila</i>	Sow seed of <i>E. orgadophila</i> fresh with no pre-treatment	Not likely to be required	Allow for regeneration or where seed is available direct seeding with <i>Aristida</i> spp. <i>Enteropogon</i> spp. and <i>Eragrostis</i> spp. and some forbs with moderate density

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.5.1 <i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>Angophora leiocarpa</i> , <i>Allocasuarina luehmannii</i> woodland on Cainozoic sand plains/remnant surfaces	On Cainozoic sand plains, especially outwash from weathered sandstones, and duplex soils with sandy surfaces.	Direct seed <i>E. crebra</i> , <i>E. populnea</i> , <i>Angophora leiocarpa</i> , <i>E. woollsiana</i> , <i>Allocasuarina luehmannii</i> , <i>Melaleuca decora</i> , <i>Callitris glaucophylla</i> and <i>C. endlicheri</i> Direct seed <i>Geijera parvifolia</i> and <i>Eremophila mitchellii</i>	Sow seed of <i>Angophora</i> spp. <i>Allocasuarina</i> spp. and <i>Eucalyptus</i> spp. fresh with no pre-treatment. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing	Optional - Undertake tubestock planting of <i>Melaleuca decora</i> , <i>Psyrax oleifolius</i> and <i>Atalaya hemiglauc</i>	Allow for regeneration or where seed is available direct seeding with perennial grasses including <i>Aristida</i> spp. should be direct seeded in low density
11.5.1a <i>Eucalyptus populnea</i> woodland with <i>Allocasuarina luehmannii</i> low tree layer on Cainozoic sand plains/remnant surfaces	On Cainozoic sand plains, especially outwash from weathered sandstones, and duplex soils with sandy surfaces	Direct seed <i>Eucalyptus populnea</i> and <i>Allocasuarina luehmannii</i> Direct seed <i>Acacia decora</i> , <i>Geijera parvifolia</i> and <i>Eremophila mitchellii</i>	Direct seed <i>Eucalyptus populnea</i> and <i>Allocasuarina luehmannii</i> with no pre-treatment. Soak seed of <i>Acacia decora</i> before sowing. Remove flesh of seed from <i>Geijera parviflora</i> and <i>Eremophila mitchellii</i> prior to sowing	Optional - Scattered plantings of <i>Owenia acidula</i>	Allow for regeneration or where seed is available direct seeding with perennial grasses including <i>Aristida caputmedusae</i> , <i>Enteropogon</i> spp, and <i>Eragrostis trichophora</i> should be direct sown
11.5.20 <i>Eucalyptus moluccana</i> and/or <i>E. microcarpa</i> / <i>E. pilligaensis</i> +/- <i>E. crebra</i> woodland on Cainozoic sand plains	Occurs on flat to gently undulating plains formed from Cainozoic/Quaternary sediments. Soils are mainly texture contrast with sandy surfaces	Direct seed <i>Eucalyptus moluccana</i> , <i>E. microcarpa</i> or <i>E. woollsiana</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i>	Sow seed of <i>Eucalyptus</i> spp. and <i>Allocasuarina luehmannii</i> fresh with no pre-treatment. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing	Not likely to be required	Allow for regeneration or where seed is available direct seeding with perennial grasses

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
11.7.4 <i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus</i> <i>angustifolius</i> on Cainozoic lateritic duricrust	On low hills and ranges with shallow soils, Cainozoic lateritic duricrusts	Direct seed mix of <i>Eucalyptus</i> spp. including <i>E. crebra</i> , <i>E.</i> <i>decorticans</i> , <i>E. tenuipes</i> , <i>Corymbia trachyphloia</i> , <i>C.</i> <i>watsoniana</i> Also direct seed <i>Callitris glaucophylla</i> , <i>Lysicarpus angustifolius</i> or <i>Acacia</i> spp.	Sow seed of <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. fresh with no pre-treatment. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing Soak seed of <i>Acacia</i> spp. in hot water, or scarify prior to seeding	Optional - Undertake tubestock planting of <i>Lysicarpus angustifolius</i>	Allow for regeneration or where seed is available direct seeding with perennial grasses such as <i>Aristida</i> spp., <i>Bothriochloa decipiens</i> , <i>Themeda triandra</i> , <i>Cymbopogon refractus</i> and <i>Eragrostis</i> spp.
11.7.7 <i>Eucalyptus fibrosa</i> subsp. <i>nubila</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus</i> spp. on Cainozoic lateritic duricrust	Occurs on low hills and ranges formed from deeply weathered sediments and shallow soils of uniform sands with stone or rocks covering much of the ground surface	Direct seed <i>E. fibrosa</i> , <i>Corymbia citriodora</i> and <i>Acacia</i> spp. and <i>E. crebra</i> on lower slopes. Direct seed lower density of <i>Corymbia trachyphloia</i> , <i>E.</i> <i>apothalassica</i> , <i>E. sideroxylon</i> , <i>Acacia shirleyi</i> , <i>Callitris</i> <i>glaucophylla</i> , <i>Allocasuarina</i> <i>luehmannii</i> and <i>Callitris</i> <i>endlicheri</i>	Sow seed of <i>Allocasuarina</i> spp., <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. fresh with no pre-treatment. Consider application of a smoke treatment to seed of <i>Callitris</i> spp. before sowing Soak seed of <i>Acacia</i> spp. in hot water, or scarify prior to seeding	Not likely to be required	Allow for regeneration or where seed is available direct seeding with perennial grasses

RE	Land type (Topography and soils)	Direct seeding guidelines (Canopy and shrub-layer)	Seed treatment guidelines	Tubestock guidelines	Groundcover establishment guidelines
Lacustrine Wetland					
11.3.27b Billabongs no longer connected to the channel flow.	NA	Direct sow <i>Eucalyptus coolabah</i> and <i>E. camaldulensis</i> fringing the wetland. Also can direct sow a wide range other species including <i>Eucalyptus platyphylla</i> , <i>E. tereticornis</i> .	Sow fresh seed of <i>Eucalyptus</i> spp. with no treatment	Optional - Undertake tubestock planting of <i>Melaleuca</i> spp. Undertake tubestock/cell planting of the wetland with the following possible aquatic species <i>Potamogeton crispus</i> , <i>Myriophyllum verrucosum</i> , <i>Chara</i> spp., <i>Nitella</i> spp, <i>Nymphaea violacea</i> , <i>Ottelia ovalifolia</i> , <i>Nymphoides indica</i> , <i>N. crenata</i> , <i>Potamogeton tricarinatus</i> , <i>Cyperus difformis</i> , <i>Vallisneria caulescens</i> and <i>Hydrilla verticillata</i>	NA

6.8.2 Rehabilitation Techniques for Broad Vegetation Groups

6.8.2.1 Brigalow

Within the Condabri Gas Fields, Brigalow Regional Ecosystems consist of REs 11.3.1, 11.4.3, 11.7.1, 11.9.5 and analogous regrowth vegetation not cleared since 31 December 1989. All Brigalow dominate REs are Endangered (EPBC Act and VM Act).

These REs represent forests and woodlands dominated or co-dominated by *Acacia harpophylla* (Brigalow) and/or *Casuarina cristata* (Belah). Brigalow and Belah are damaged by intense fires. Any regrowth is usually whip-stick sucker regrowth.

Promoting existing regrowth of Brigalow and Belah is the most efficient way to rehabilitate these REs. Natural germination events of Brigalow are extremely rare (e.g. once every few decades). Brigalow is soft-seeded, so germination is not promoted by fire. Propagation of Brigalow from root suckers could be trialled and planting of tubestock should be considered where there is limited regrowth due to soil disturbance.

Belah seeds develop within capsules that remain unopened on the tree for a few years. Store capsules in a paper bag, where the capsules will open and drop seed within days of collection from the tree. No seed treatment is necessary. Sow fresh seed of Belah directly onto the site. Typically associated eucalypts include *Eucalyptus coolabah*, *E. cambageana* and *E. populnea*. The seed of these eucalypts falls from the capsules when mature, although seed is not always produced annually. Collect mature capsules before or as seed is released. All endemic *Eucalyptus* sp. seed should be sown fresh with no pre-treatment necessary.

Fires should be excluded from Brigalow woodlands by maintaining low fuel loads in adjacent eucalypt woodlands, through grazing, slashing or low-intensity burning. Where invaded by exotic grasses, especially Buffel Grass, reduce the fuel loads through stock grazing, or herbicide control of grasses on the margins. The use of very low intensity, mild fires on the margin of Buffel Grass invaded Brigalow communities, followed by herbicide spraying of Buffel Grass regrowth is a successful way of reducing Buffel Grass dominance.

For existing Brigalow communities adjacent to infrastructure on-ground management activities likely to assist in recovery as outlined in the Brigalow (*Acacia harpophylla* dominant and co-dominant) Recovery Plan (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and tracks) in or adjacent to remnants to minimise weed incursion
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses)
- managing grass fuel loads and maintaining fire breaks to avoid hot fires in remnants Section 4.11.

6.8.2.2 Callitris Dominated or Co-dominated Woodlands

Callitris (Cypress Pine) dominated or co-dominated woodlands are represented by REs 11.3.14 and 11.5.4. Both of these REs are listed as Least Concern under the VM Act.

These REs are dominated by *Callitris glaucophylla* (White Cypress Pine) and *Allocasuarina luehmannii* (Bull Oak or Buloke) with co-dominant eucalypts. Seed of the dominant trees of these ecosystems (i.e. White Cypress Pine and Buloke) germinate easily. Therefore these ecosystems can be revegetated moderately easily and regrowth can be enhanced using direct seeding of these species.

Cypress Pines produce seed within cones which open when mature. Seed should be collected from near-ripe cones, by cutting branches containing cones and allow to ripen within a paper bag or on a tarp to collect released seed. Sow fresh seed directly onto the site, where a moderate establishment rate should be expected during an adequate wet season. Exposing seeds to ambient temperature smoke before sowing may enhance the germination of Black Cypress Pine and White Cypress Pine.

The associated Buloke holds seed in un-opened capsules on the tree. Seeds will be released from capsules after collection. Sow fresh seed, without any pre-treatment. Buloke is a relatively fast growing tree, which will help re-establish these ecosystems quickly. Wattles are often present, such as *Acacia leiocalyx* and *Acacia wardellii*. Soak wattle seed in hot water over night prior to direct seeding.

Cypress Pines are killed by fires that scorch the entire canopy, but mostly survive fires that burn through the grass without scorching all leaves. Seed germination of White Cypress Pine can be promoted by fire. Therefore, to maintain Cypress Pine, it is important to restrict any fires to a low intensity. Occasional fires within cypress pine forests may benefit cypress seedling recruitment and promoting associated grasses and herbs.

6.8.2.3 Lancewood and Bendee Dominated Woodlands

Acacia shirleyae (Lancewood) and *A. catenulata* (Bendee) dominated woodlands are represented by RE 11.7.2 which is listed as Least Concern under the VM Act.

Lancewood and Bendee occur in dense thickets or woodlands on poor soils. Lancewood, and to a lesser degree Bendee, have fire-promoted hard seeds. Therefore seed should be soaked in hot water, or scarified, prior to seeding. Other associated wattles, such as *Acacia sparsiflora* and *A. rhodoxylon* would also benefit from soaking seeds in hot water. Alternatively, a fire could be implemented in an area that previously contained Lancewood to promote any remaining soil seed reserves. However, Lancewood and Bendee are fire-killed and so fire must be kept out of rehabilitation areas after seedling establishment. Direct sowing of seed is an efficient means of recruiting Lancewood and Bendee.

Lancewood and Bendee are killed by fire. Seed germination of Lancewood can be promoted by fire but seedlings can take 15 years to re-establish mature canopies. Fires allow grasses to invade these forests, which promote subsequent fires. Often Lancewood and Bendee forests grow on rocky outcrops and scarps that naturally reduce the occurrence of fires. However, where fuel loads build up in the surrounding landscape, intense fires can carry into Lancewood and Bendee forests during dry years. Maintain low fuel loads in eucalypt woodlands adjacent to Lancewood and Bendee forests, through grazing or regular, low intensity burning of eucalypt woodlands. Where burning in adjacent woodlands, ignite fires from near the edge of forests to ensure fire burns away from the boundary.

6.8.2.4 Eucalypt/Corymbia Dominated or Co-dominated Woodlands

Eucalypt dominated or co-dominated woodlands are represented by REs 11.3.2, 11.3.3, 11.3.4, 11.3.18, 11.3.25, 11.4.12, 11.4.13, 11.5.1, 11.5.1a, 11.5.20, 11.7.4 and 11.7.7. These REs are listed as Least Concern and Of Concern under the VM Act. RE 11.3.2 is the exception and is endangered if there is a presence of Weeping Myall (*Acacia pendula*) within the ecosystem.

Eucalypt woodlands in the Project area typically contain abundant small saplings amongst the grass layer, which act as recruits to replace dying trees. However, natural seed germination events of eucalypts are rare, occurring following the right timing and quantity of rainfall. Natural germination of some eucalypts occurs more often, such as in *Corymbia citriodora* (Spotted Gum), than in others such as *Eucalyptus crebra* (Narrow-leafed Ironbark). Therefore, encouraging regrowth of previous eucalypt woodlands is more efficient than revegetating bare areas.

The seed of eucalypts fall from the capsules when mature, although seed is not always produced annually. Collect mature capsules before or as seed is released. Seed should be sown fresh with no pre-treatment necessary.

Various wattles (*Acacia* spp.) grow within eucalypt woodlands. These wattles require seeds to be soaked in hot water prior to sowing. Wattles should establish easily from direct seeding after soaking in hot water. However, it is important not to sow high densities of wattles, because they form wattle thickets that smother out the regeneration of other plants.

Other associated shrubs with fleshy fruits (e.g. *Geijera parviflora* and *Eremophila mitchellii*) will germinate at a higher rate if the flesh is removed from around the seed prior to sowing.

The structure and species composition of eucalypt woodlands is maintained through the use of moderately regular burning. Burning in eucalypt woodland sites that are adjacent to fire sensitive vegetation (e.g. Brigalow and SEVTs) provides protection from wildfires to those sensitive habitats. Fuel reduction burning should primarily occur within these eucalypt woodlands. Implement moderately regular burning under mild conditions to create a patchily burnt landscape. Fire killed shrubs (e.g. *Acacia decora*) and trees (e.g. Cypress Pine and Buloke) associated with these eucalypt woodlands require long fire intervals to regenerate to maturity. Limit active burning in these areas by burning under mild conditions.

6.8.2.5 Freshwater Wetlands

In Condabri Development Areas freshwater wetlands are represented by RE 11.3.27b which is considered Least Concern (VM Act) and Of Concern (EP Act).

The aquatic environment of these water bodies which occur as billabongs no longer connected to channel flow are very diverse with aquatic vegetation. These water bodies are benefitted by large rain events that fill them via overland flows.

Post disturbance recovery will involve natural regeneration combined with tubestock or cell planting of aquatic species such as *Potamogeton crispus*, *Myriophyllum verrucosum*, *Chara spp.*, *Nitella spp.*, *Nymphaea violacea*, *Ottelia ovalifolia*, *Nymphoides indica*, *N. crenata*, *Potamogeton tricarinatus*, *Cyperus difformis*, *Vallisneria caulescens* and *Hydrilla verticillata*.

Vegetation fringing the wetland is sparse and generally consist of two dominate eucalypts, *Eucalyptus coolabah* or *E. camaldulensis* but a wide range of other species including *Eucalyptus platyphylla*, *E. tereticornis*, *Melaleuca spp.* or *Acacia spp.* can also be present. Refer to section 8.1.1.5 for Eucalypt and Acacia seeding details. *Melaleuca spp.* is commonly found and these species would benefit from tubestock planting.

Fire is a general threat to this ecosystem when the water levels in the water body are low and the base or root systems of aquatic species are exposed, otherwise fire is not a threat but a useful management tool in control of weeds and fuel loads. Burning is best at times were soil moisture is available.

6.8.3 Rehabilitation techniques for TECs

This section contains specific rehabilitation techniques for vegetation communities listed as TECs under the EPBC Act.

6.8.3.1 Brigalow communities

Brigalow community REs represent forests and woodlands dominated or co-dominated by *Acacia harpophylla* (Brigalow). Brigalow communities are damaged by intense fires which can effect key habitat requirements for animal species that associate with Brigalow ecological communities. Any regrowth is usually whip-stick sucker regrowth.

Promoting existing regrowth of Brigalow is the most efficient way to rehabilitate these REs. Natural germination events of Brigalow are extremely rare. Brigalow is soft-seeded, so germination is not promoted by fire. Propagation of Brigalow from root suckers could be trialled and planting of tubestock should be considered where there is limited regrowth due to soil disturbance. Engagement with reputable local and selected seed suppliers that provide local provenance stock will be undertaken to ensure a necessary supply of Brigalow propagates will be utilised to service the rehabilitation needs for these TECs when required. Sourced propagates can be provided to, or propagated by a suitably qualified nursery stock provider to deliver Brigalow tubestock for revegetation efforts on a needs basis.

Belah seeds develop within capsules that remain unopened on the tree for a few years. Store capsules in a paper bag, where the capsules will open and drop seed within days of collection from the tree. No seed treatment is necessary. Sow fresh seed of Belah directly onto the site. Typically associated eucalypts include *Eucalyptus coolabah*, *E. cambageana*, *E. woollsiana* and *E. populnea*. The seed of these eucalypts falls from the capsules when mature, although seed is not always produced annually. Collect mature capsules before or as seed is released. Seed should be sown fresh with no pre-treatment necessary.

Managing for fire prevention on supporting landholders properties will involve fire prevention around operating infrastructure and as conducted by the landholder themselves. Maintaining low fuel loads in adjacent eucalypt woodlands, through grazing is the most practical application where land management is the responsibility of the landholder. The maintenance measures for maintaining low fuel loads within Brigalow woodlands will be undertaken on properties owned by Australia Pacific LNG. The landowners on estates adjacent to the development area are responsible for the management of the vegetation. Where Brigalow woodlands are invaded by exotic grasses, especially Buffel Grass, reduction of the fuel loads through stock grazing, or herbicide control of grasses on the margins may be a management option.

Many different weed and pest species are invaders of Brigalow communities. Weed species cause the greatest impact where edge to area ratio is high. Feral pigs are identified as the most likely pest species to cause the greatest impact on Brigalow communities.

For existing Brigalow communities adjacent to infrastructure on-ground management activities likely to assist in recovery as outlined in the Brigalow (Acacia harpophylla dominant and co-dominant) Conservation Advice (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and roads) in or adjacent to remnants to minimise weed incursion
- avoiding fragmentation of Brigalow communities
- appropriately manage grazing pressure of livestock in agreement with landholder
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses), and
- managing grass fuel loads and maintaining property fire breaks
- maintaining quality of litter cover and woody debris.

6.8.3.2 Semi-evergreen Vine Thicket (SEVT)

Vine thickets are dominated by species such as *Ehretia membranifolia*, *Apophyllum anomalum*, *Geijera parviflora*, *Capparis* spp., *Croton phebaloides*, *Erythroxylum australe*, *Alectryon diversifolius*, *Cadellia pentastylis* and *Carissa ovata*. SEVTs may also have Brigalow trees and *Brachychiton* species (Bottle Trees) may form an emergent layer above the vine thicket.

Semi-evergreen vine thickets have a high diversity of tree and shrub species compared to other ecosystems in the region. Their rehabilitation will best be achieved by enhancing the regrowth of existing remnant patches. SEVTs can be damaged by cattle, with seedling establishment often inhibited, so fencing of rehabilitation areas may be a worthy requirement.

Seeds of SEVT species are produced within capsules that open to release seeds (e.g. *Brachychiton* species, *Denhamia oleaster*, and *Geijera parviflora*) or are surrounded by a fleshy pulp (e.g. *Ehretia membranifolia*, and *Erythroxylum australe*). Seeds produced within capsules can be collected by tying bags over near-mature fruits to collect seed as they mature and fall, or by collecting nearly mature capsules and storing within bags. No seed treatment is required. For some SEVT species planting of tubestock will be required. Engagement with reputable local and selected seed suppliers that provide local provenance stock will be undertaken to ensure a necessary supply of SEVT species seeds can be obtained to service the rehabilitation needs for this TEC. Sourced seed can be provided to, or propagated by a suitably qualified nursery stock provider to deliver SEVT species tubestock for revegetation efforts on a needs basis.

Vine thicket plantings may require supplementary watering support during establishment depending upon climatic conditions, as they are mostly very slow growing. Plantings are prone to invasion by weeds, especially grasses, and will require several maintenance treatments over the first 3-5 years.

Semi-evergreen vine thicket plants are damaged by fires, even of a low intensity. While some scrub plants may re-shoot following a fire, their canopy height is lost and they are slow to recover. Fires allow grasses to invade the SEVTs, which promote subsequent fires. Keeping fire out of rehabilitation areas is important for all rehabilitating ecosystems, but especially so for SEVTs. Low fuel loads should be maintained in woodlands adjacent to rehabilitating vine thickets, through grazing or regular, low intensity burning of eucalypt woodlands. These responsibilities outside of infrastructure fire management are the responsibilities of the landholder for their property management.

Further best practice management practices for SEVTs are outlined in the National Recovery Plan for SEVTs (MacDonald 2010). For existing SEVT communities adjacent to infrastructure on-ground management activities likely to assist in recovery as outlined in the National Recovery Plan for SEVTs (DSEWPaC 2011) include:

- limiting disturbance (e.g. clearing for, or maintenance of, fence lines and roads) in or adjacent to remnants to minimise weed incursion
- manage feral animal impacts
- making regular checks and carrying out appropriate treatment to avoid weed invasion (especially by exotic grasses), and;
- managing grass fuel loads and maintaining fire breaks to avoid hot fires in remnants.

6.8.4 Flora Species of Conservation Significance

Flora species of conservation significance are those species listed under the EPBC Act as Extinct, Extinct in the wild, Critically Endangered, Endangered, Vulnerable or Conservation dependent and/or the under the NC Act as Endangered, Vulnerable or Near Threatened (EVNT). The Threatened Flora Management Plan (Q-LNG01-15-MP-0108) identifies the Threatened and Near Threatened flora species that are known or potentially occur within the Gas Fields area.

6.8.4.1 Rehabilitation objective

The primary objective will be to avoid populations of flora species of conservation significance as outlined in the Australia Pacific LNG Environmental Constraints and Field Development Protocol (Q-LNG01-15-MP-0109) and the Threatened Flora Management Plan (Q-LNG01-15-MP-0108). Where impacts are unavoidable the rehabilitation objective in relation to significant flora is the successful regeneration of flora species, successful translocation or establishment of offsets to ensure no net loss of individuals or populations. This will be determined for specific sites where populations are detected on an individual species basis on the advice of an approved ecologist and or outlined in State issued *Nature Conservation Act 1992* protected plant clearing permits.

6.8.4.2 Rehabilitation techniques

Natural regeneration will be used to rehabilitate areas containing flora species of conservation significance. Translocation, propagation and replanting of tubestock of plant species will be undertaken where established to be effective for that particular species. These actions are to be informed by species monitoring activities post construction.

In areas where threatened flora (i.e. NC Act listed EVNT or EPBC Act listed MNES species) are present prior to disturbance (construction) and regenerating post disturbance (maintenance), it is mandatory to strip and preserve seed bank prior to removing remainder of topsoil profile. Strip the top 50mm of soil and keep separate from other stockpiles. Strip the area containing the threatened flora population to be cleared plus a ten meter buffer within the disturbance area (NB: do not exceed disturbance area) The seed bank stockpile must be signposted to inform personnel that the stockpile is to be kept separate and replaced during rehabilitation as the top layer.

In addition to the general rehabilitation techniques listed above, the following specific control measures will be site dependant and may need to be put in place during the rehabilitation process:

- install erosion and sediment control measures as per site specific specifications of erosion and sediment control plans to protect the location/s of conservation significant flora from scouring and sedimentation without significantly altering surface water conditions
- avoid broad-scale spraying of herbicides for weed management in proximity to populations of flora species of conservation significance
- undertake the construction of fencing until plant populations have established, to prevent grazing or browsing damage
- implement targeted weed control measures where weeds are identified a threat to flora species of conservation significance
- introduce species provenances where genetic influences limit population viability e.g. *Rutidosis lanata*
- implement pest animal control measures if on Australia Pacific LNG land, and;
- implement ecological fire management guidelines if on Australia Pacific LNG land.

6.8.5 Habitat of Fauna Species of Conservation Significance

The Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) identifies fauna species of conservation significance that are known or potentially occurring within the Gas Fields area

6.8.5.1 Rehabilitation objective

The primary Project and Operations maintenance/decommissioning objective is to avoid habitat of fauna species of conservation significance as outlined in the Protocol and the Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan Addendum (Q-LNG01-15-MP-0113_01). Where impacts are unavoidable the rehabilitation objective in relation to fauna habitat is the successful rehabilitation of fauna species habitat, or establishment of populations in translocation sites and/or establishment of offsets as outlined in Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) and any relevant offset proposals.

6.8.5.2 Rehabilitation techniques

Natural regeneration where practicable to operating infrastructure will be used to rehabilitate the habitat of fauna species of conservation significance. Direct seeding or tubestock planting with native species representative of the ecologically dominant layer for the site specific RE and ground habitat features will also be undertaken, as required, at the time of decommissioning. At this time it will be necessary to ensure rehabilitation includes food trees appropriate to the fauna species, the habitat, and land tenure type (e.g. Belah for Glossy Black Cockatoo or Spotted Gum for Sugar Glider). Species specific requirements are outlined in Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01).

In addition to revegetation, the retention of habitat features such as logs, hollows and litter will be vital for maintaining habitat values. The following measures will be put in place to maintain habitat features during Project construction and operational maintenance, in particular during clearing and re-spreading of timber:

- where trees with hollows are felled and suitable equipment is present on site, relocate to suitable adjacent habitat
- retain some felled timber to locate within adjacent habitat to increase sheltering opportunities for displaced animals
- spread mulch, timber (where practicable) and leaf litter into the area to assist in the restoration of micro-habitat and artificially increase ground debris, and
- install suitable nest boxes, if recommended by an ecologist or outlined in a Species Management Plan, within surrounding confirmed habitat if trees bearing medium to large hollows are felled, and where practicable, fencing off from stock may be required, depending on adjacent land use, to prevent degradation of habitat of listed fauna species.

If habitat of species of conservation significance are located within riparian vegetation downstream of the clearing site or in adjacent wetland areas, the following measures will also be implemented:

- install erosion and sediment control measures as per site specific specifications of erosion and sediment control plans to protect the habitat from scouring and sedimentation without significantly altering surface water conditions
- minimise impacts of infrastructure on temporary shallow wetlands through alteration of drainage conditions or siltation, and
- avoid the broad application of herbicides, insecticides and other chemicals when undertaking maintenance near wetlands and other water bodies.

Australia Pacific LNG Upstream Phase 1 Threatened Fauna Management Plan and Addendum (Q-LNG01-15-MP-0113 & Q-LNG01-15-MP-0113_01) will make specific reference to the measures necessary to be undertaken within the gas field development more specifically adopted for MNES.

6.8.6 Pastoral Land

In terms of individual properties, the level of disruption to agricultural land uses will depend upon the siting of wells, access roads, underground pipelines and treatment facilities. Given the nature of the gas resource, there is some flexibility to adjust the location of wells (subject to operational needs). Similarly, the location of access tracks and pipeline easements may be varied to a degree. It is Australia Pacific LNG's intention to discuss the location of these items with landholders to reduce the level of potential disruption.

The Project will put in place mitigation measures where the potential to disrupt farming practices exists. These measures would include the exchange of information about proposed Project activities with individual property owners. Such information will include an overview of infrastructure layouts, activity outlines, timetable of events, environmental and vehicle hygiene management plans and potential compensation arrangements. Landholders will be encouraged to contact a member of the Australia Pacific LNG landholder relations group in relation to their property and/or the Project.

6.8.6.1 Rehabilitation objective

The aim of rehabilitation is to restore the production potential of pastoral land. Australia Pacific LNG will determine the required land use of individual properties in consultation with landholders. This will guide soil preparation upon reinstatement and determine the seed mix that is applied.

6.8.6.2 Rehabilitation techniques

Areas where grazing is the required final land use will be sown with appropriate pasture species as agreed with landholders. Local native grasses may be used in some situations, such as where it is desirable to return an area to grazing on unimproved native pasture. The application of desired seed mixes may not always result in the establishment of the preferred pasture as seed presence within the soil seed bank will influence the vegetation presence including pasture growth and diversity.

6.8.7 Cropping Land

The location of infrastructure is selected and negotiated with landholders to minimise the impact to agricultural land productivity. Infrastructure will, in some situations be sited within Strategic Cropping Land (SCL), but where practicable SCL is avoided, and where SCL is present options for pad drilling will be assessed.

Pre-disturbance soil surveys of areas to be disturbed has been undertaken broadly at a scale of 1:100000 for the pipeline well and flowline network and 1:25000 for facilities locations. This will ensure that soil management specific conditions in the various EAs within Schedule D, in regard to soil assessment and management are met. Further efforts to identify soils and management measures at a lower scale is undertaken prior to construction and sources similar information to help inform the construction method undertaken.

Landholders will be consulted where Project infrastructure (such as access tracks and pipelines) is to be established through GQAL to ensure timing of the works does not unduly affect farming operations. Where possible, access tracks and associated pipelines will use existing tracks, fence lines and road reserves.

6.8.7.1 Rehabilitation objective

The aim of rehabilitation is to restore the production potential of cropping land. Australia Pacific LNG will determine the required land use of individual properties in consultation with landholders. This along with soil management information utilised to determine construction methods will guide soil preparation, in regard to removal, stockpiling and reinstatement with or without amendment dependant to advice. Although cropping is the desired final land use, areas may be sown with sterile grass species to stabilise soils if required by the landholder.

6.8.7.2 Rehabilitation techniques

Where disturbance of cropping land is unavoidable, the careful management of topsoil and subsoil will form an important component of the rehabilitation strategy. On cropping land access tracks will seek to avoid cropping areas and will generally not be gravelled. At the completion of construction, wastes will be removed, temporary access routes will be closed and subsoils will be replaced with a topsoil capping.

Before topsoil re-spreading on cropping land, topsoil that has been stockpiled for long periods will be re-analysed. In the event that soil stockpiles have existed for longer than 12 months and/or it is suspected that topsoil has been degraded by construction works (for example excessive traffic or blending with subsoils or mulch) then laboratory analysis must be undertaken to determine suitability for reuse. Analysis shall be undertaken for the following parameters and reports given to an Environmental Advisor with recommended mitigation measures (e.g. amelioration):

- pH
- Electrical Conductivity
- Total Nitrogen
- Colwell phosphorous
- Exchangeable Cations (Calcium, Magnesium, Potassium, Sodium) using the pre-wash method
- to enable calculation of Cation Exchange Capacity (CEC)
- Calcium/Magnesium ratio (Ca:Mg)
- Exchangeable Sodium Percentage (ESP)
- Soil classification based on particle size.

Additional nutrients (specifically nitrogen and phosphorus-based fertilisers, depending on the type of revegetation planned), organic fertilisers (manure) or conditioners may be required to improve topsoils and return them to a productive state for cropping. Fertilisers and soil supplements will be used only as necessary and with the agreement of landholders.

Following topsoil spreading, areas may be sown with appropriate cover grass species, however in cropping areas generally no seed will be planted as agreed with the landowner.

6.8.8 Riparian Areas and Water Crossings

Riparian areas and watercourses have the potential for higher biodiversity than the surrounding landscape. They provide water for many flora and fauna species adapted to specialist habitats characterised by permanent/semi-permanent surface water.

The Gas Fields area is dissected by creek systems with associated alluvial soils that support open forests of *Eucalyptus tereticornis* (Queensland Blue Gum), *E. camaldulensis* (River Red Gum), *Angophora floribunda* (Rough-barked Apple), *A. leiocarpa* (Smooth-barked Apple) and *Casuarina cunninghamiana* (River She-oak). These communities have often been retained as a vegetated riparian corridor through cleared agricultural land. They provide an important habitat for a wide variety of fauna.

The Gas Fields area contains several significant major creeks and it will be necessary for pipelines and access tracks to cross them in some locations.

6.8.8.1 Rehabilitation objective

The primary objective is to minimise impacts to riparian areas and watercourses by selecting a suitable crossing point in regard to the vegetation community, landform constraints and the landholder requirements. Where impact is unavoidable, mitigation measures will be adopted including minimising the area of disturbance and impacts on riparian vegetation and water quality.

Where clearing of riparian vegetation is unavoidable the objective will be to reinstate the creek bed and banks and establish a ground cover as soon as practical post-construction. This reinstatement will be consistent where practicable with the surrounding environment and contours of the channel at the time of construction. Further objectives are to minimise erosion and destabilisation of creek banks, and restore vegetation and fauna habitat.

Upon decommissioning the establishment of predominant species of the ecologically dominant layer to the RE will be encouraged to grow through regeneration, active planting or seeding, as specific sites require.

6.8.8.2 Rehabilitation techniques

Rehabilitation of waterway crossings will involve contouring disturbed areas to where practicable match the surrounding land or an alternative stable bank design as soon as practicable after pipe laying and backfilling. Erosion controls will be constructed or installed, such as surface stabilisation, matting or armouring where necessary. The surface preparation will usually be lightly scarified before spreading the topsoil, to promote vegetation growth and protect against the topsoil loss.

Rehabilitation will be undertaken and will ensure that:

- Disturbed drainage lines will be stabilised as soon as practicable following disturbance and construction works staged to minimise the duration of exposed disturbed areas. Stabilisation may include soil binders, biodegradable matting or meshes or rock as required based on stream flow rate
- any water ingress into trenches will be handled with pumping from the trench utilising APIA Code methods for sediment and erosion control
- temporary facilities such as waterway barriers will be removed and the areas reinstated
- seed spreading or planting of tubestock consisting of bank stabilisation species will be carried out in areas at risk of erosion or in densely vegetated watercourses to enhance natural regeneration, and;
- pipelines will be backfilled and the potential for normal flow reinstated as soon as practicable.

6.8.9 Stock Routes

The primary purpose of the stock route network is to provide for travelling stock, although other secondary uses may occur within a stock route. These other uses may include the short-term adjustment of parts of the route, the establishment of watering agreements with private landholders, and the construction and maintenance of stock route facilities. A road that is a stock route may be used as a transport corridor for vehicles or for communication and utility infrastructure facilities, for example phone, power and gas lines. Impacts on stock routes will generally arise from the clearing of vegetation and ground disturbance associated with the laying of gas and water pipeline networks. No plant or water storage sites will be located within a stock route.

6.8.9.1 Rehabilitation objective

It is a Coordinator General's condition (Coordinator General's Report, Appendix 1, Part 1, Condition 6) that parts of the stock route network disturbed or affected by works be rehabilitated upon completion of the Project to a state that is safe for travelling stock and drovers, and the travelling public, and is consistent with the area's pre-disturbance state unless otherwise agreed by DEHP and the local government.

6.8.9.2 Rehabilitation techniques

Ground disturbance to stock routes will be reinstated as soon as practicable following the cessation of construction activities. Stock routes will be reinstated to return the topsoil profile and establish a ground cover consistent to that of the surrounding land use. Any watering points disturbed by construction activities are to be reinstated.

6.9 Pest Species Management

6.9.1 Restricted Invasive plant species

Some restricted invasive plant species are a potential threat to rehabilitation, and to MNES, given the nature of the proposed activities (particularly clearing and soil disturbance during construction). Species identified as restricted matters under the Queensland *Biosecurity Act* 2014 are present in the Gas fields areas and will be managed in accordance with the Origin Energy Biosecurity Management Plan – Queensland (CDN/ID 8057416)

The Biosecurity management plan is supplemented by the following procedures:

- Biosecurity Management – Construction (Q-1000-15-AP-072)
- Biosecurity Management Procedure (OEUP-Q1000-PRO-ENV-042)
- Biosecurity Hygiene Procedure (OEUP-Q1000-PRO-ENV-036)
- Biosecurity Imported Cargo Procedure (OEUP-Q1000-PRO-ENV-041).

Restricted invasive species are managed by following:

- LNG Operations and Pilot Operations Weed Management Procedure (QLD-1000-ENV-PRO-00011)
- Queensland LNG Operations & Pilots Record of Weed Management Form (QLD-1000-ENV-FRM-00012)
- Site specific weed management plans, and;
- Technical instructions for specific species weed management i.e.: *Parthenium* (*Parthenium hysterophorus*), Mother of millions (*Bryophyllum* sp.), Prickly Pear (*Opuntia* sp.)

6.9.2 Prohibited or restricted invasive animals

Some restricted invasive animals are a potential threat to rehabilitation, and to MNES via predation or grazing impacts. Species identified as restricted invasive animals within the land management responsibilities of Australia Pacific LNG/Origin Energy under the Queensland *Biosecurity Act* 2014 will be managed in accordance with the Origin Energy Biosecurity Management Plan – Queensland (CDN/ID 8057416).

The Biosecurity management plan is supplemented by the following procedures:

- Biosecurity Imported Cargo Procedure (OEUP-Q1000-PRO-ENV-041), and;
- Site specific pest management plans for Origin Energy and Australia Pacific LNG properties.

6.10 Fire Management

The risk of bushfire is a concern of all landholders and for rehabilitation works as a bushfire can severely impact upon all land uses. The damage to crops, fodder, buildings and other farm infrastructure from fire can be devastating to landholder livelihoods. Gas Fields development and operation must maintain the safety of people and property by mitigating any introduced risk. Given the nature of the Project and its rural setting, it is impractical to locate all project components to avoid bushfire hazard areas. The Australia Pacific LNG Fire Management Strategy (Q-LNG01-15-EA-0062) is utilized as a guide to inform the service providers of fire mitigation requirements for the Project.

In regard to operating infrastructure, bushfire risk will be managed utilising Area Asset Mitigation Plans and Area Preparedness and Response Plans specific to the asset location (i.e.: Condabri tenure). Practically asset protection zones or APZs will be managed around infrastructure.

6.11 Land Maintenance

Following reinstatement, limited access to infrastructure will be allowed to perform essential maintenance, such as mowing or repair requirements and drilling activities such as well workovers. All other traffic is prohibited on topsoil areas and should remain off the rehabilitating areas to enable successful establishment of groundcover.

Maintenance will take place as required following monitoring to ensure the following objectives are met:

- landforms remain stable
- erosion control measures remain effective
- stormwater runoff and seepage from reinstated areas does not negatively affect the environmental values of any waters
- plants show healthy growth and recruitment is occurring, and;
- Restricted matter weed species are managed in accordance with the Biosecurity Act 2014 requirements.

6.11.1 Watering

Due to scarcity of water and large potential areas, it is not be feasible to apply water to seeded or regenerating areas for reinstatement or ongoing rehabilitation. Watering will be utilised where specified in site specific rehabilitation plans for high risk locations including pond batters. Where applicable for final rehabilitation, rehabilitation areas of the SEVT TEC, where there is a high water requirement for the establishment of vine thicket species, will require watering, where tubestock planting is undertaken. Initial watering after tubestock planting will be a necessity to establishment. Watering is to be undertaken with water of a quality suitable for the purpose and authorised for this use. Use of untreated CSG water must comply with the General Beneficial Use Approval – Associated water (including Coal Seam Gas water), 2014 (BUA).

6.12 Corrective actions

6.12.1 Construction corrective actions

Upon completion of reinstatement an end of construction Field Inspection Checklist (FIC) is undertaken utilising reinstatement criteria for the construction activity. Corrective actions identified from this inspection action is added to a punch list of items forwarded to the responsible contractor for follow up rectification. Ongoing monitoring continues in this timeframe via walk downs and further identified defects are raised and logged to the principle contractor. The contractor will work towards the close out the open items of this defect list and handover to operational management occurs where any ongoing requirements or maintenance requirements for land management are undertaken. Operational management is discussed below.

6.12.2 Operational corrective actions

Sites not displaying stability and adequate vegetation cover through either regrowth or direct seeding may undergo reseeding, replanting or another supported effort for regeneration. This requirement will be determined via rehabilitation monitoring as discussed in Section 8. Monitoring for reinstatement and rehabilitation success is undertaken post construction and in the subsequent years of operation and decommissioning. In areas where native vegetation is required as a ground cover or ecosystem, and regeneration efforts or direct seeding was unsuccessful, follow up reseeding or tubestock planting may be required dependent upon the necessary outcome for the site (e.g. operational or final rehabilitation). Corrective actions will be informed via the Oracle Enterprise Asset management System (eAMS), a work request system outlining the location and necessary task to be completed as well as a scheduled timeframe for the task. The work request system will involve the necessary site planning and environmental requirements to rectify the identified issue, with works scheduled for delivery via contracted services and overseen by Origin Energy Civil Supervisors.

Where operational corrective actions are required the following may be undertaken as a minimum:

- Site assessment will be undertaken by a suitably qualified and experienced person to determine the likely cause of reinstatement or rehabilitation failure or defects, and develop site specific corrective actions
- implement site specific corrective actions
- monitor effectiveness of actions taken to restore land
- works may be conducted in consultation with the relevant landholder.

6.13 Waste Management and Removal

Waste management for the Project and Operations is undertaken in accordance with the Australia Pacific LNG Upstream Waste Management Plan (Q-1000-15-MP-0001) which provides requirements for the safe handling, management and disposal of waste.

All construction wastes must be removed from site and disposed of in accordance with the Waste Management Plan and legislative requirements as part of reinstatement activities.

On asset decommissioning and at final rehabilitation all above ground infrastructure will be removed with the exception of infrastructure for beneficial use as agreed with the landholder. All below ground infrastructure i.e.: pipelines (steel and HDPE) will be suspended and abandoned as per the Pipeline Suspension and Abandonment Procedure (OEUP-Q1000-PRO-PIP-002). All wastes from surface and any wastes which would inhibit achievement of final rehabilitation objectives will be removed at the necessary depth and disposed of in accordance with the Waste Management Plan and legislative requirements.

Specific requirements for the removal of infrastructure such as concrete columns under GPF structures will be addressed in infrastructure specific decommissioning plans.

7. Remediation

7.1 Notifiable Activities

Activities that have been identified as likely to cause land contamination are listed in Schedule 3 of the *Environmental Protection Act 1994*. Under the Act, landowners or occupiers and local government must inform the department (DEHP) that land has been or is being used for a notifiable activity. Land that has been or is being used for a notifiable activity is recorded on the Environmental Management Register (EMR), which is maintained by DEHP.

Australia Pacific LNG Project Gas Field EMP's list the range of notifiable activities associated with Gas Field development and they are listed below as they appear in Schedule 3 *Environmental Protection Act 1994*:

- 7. Chemical storage (other than petroleum products or oil under item 29)-storing more than 10t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code
- 23. Metal treatment or coating-treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5L of paint per week (other than spray painting within a fully enclosed booth)
- 29. Petroleum product or oil storage-storing petroleum products or oil-
 - (a) in underground tanks with more than 200L capacity; or
 - (b) in above ground tanks with-
 - (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code-more than 2500L capacity; or
 - (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code-more than 5000L capacity; or
 - (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia-more than 25 000L capacity.
- 37. Waste storage, treatment or disposal-storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50,000 persons having sludge drying beds or on-site disposal facilities.

Areas within the Gas Field operation that include these notifiable activities will be registered on the EMR. Land may be removed from the EMR if the landowner or occupier has information that shows the listing was either incorrect, i.e. the land has not been used for a notifiable activity or that the land is not contaminated. Land is removed from the EMR if, after a site investigation report has been submitted to the administering authority no contamination is found or work is done to satisfactorily remediate the land.

Where notifiable activities have taken place and or hazardous materials have been released a site specific remediation plan must be developed by a suitably qualified person.

7.2 Site Investigation

A formal contaminated land procedure is currently in revision and will replace the Australia Pacific LNG Land Contamination Procedure Discovered or Known land contamination (Q-LNG01-15-AP-0013) and will be finalised February 2017 as a process of refreshing the HSE objectives for the LNG Integrated Gas business. Following completion of the HSE refresh this procedure will direct the necessary actions from the site investigation step through the management of contaminated land.

Preliminary site investigations are conducted to determine the presence or absence of site contamination where notifiable activities have been conducted, where evidence of leakage or spillage of hazardous material is detected.

A preliminary site investigation will include the following components:

- development of a site history
- an inspection of the site
- a basic sampling program to determine if contamination is present; and
- report preparation.

Investigations will be conducted by suitably qualified persons. The *Environmental Protection Act 1994* requires persons submitting contaminated site investigation reports to be members of a prescribed professional organisation listed in Schedule 8 of the *Environmental Protection Regulation 2008*. Persons conducting site investigations should hold appropriate qualifications, have experience relevant to the investigation and be approved by DEHP.

A comprehensive site history of the investigation area will identify all past and present potentially contaminating activities. Information obtained from the site history research will be used to assess the potential for contamination on the site and determine the most appropriate locations for sampling. Sampling is required in areas where the site history research indicates that possible contaminating activities have been conducted. Site history information will be supported by all available copies of original site plans, local authority zoning records, flammable and combustible liquids licence details, sewerage/trade waste and stormwater drainage plans, aerial photographs, environmental licences etc. All available evidence, including verbal interviews and analysis reports, will be included. Interviewees' relationship to site activities should be documented.

The possibility of contamination due to activities on adjacent land and the possibility of contamination extending beyond the site boundaries should also be examined and areas which have received imported fill should also be assessed.

Site investigations should be conducted in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* and attending Schedules and the provisions of the *Environmental Protection Act 1994*.

7.3 Mitigation Strategies

7.3.1 Dams

Several types of saline dams will operate for the treatment of associated water and other by-products. These facilities are defined as regulated dams under DEHPs draft Manual for Assessing Hazard Categories and Hydraulic Performance of Dams where hydraulic design parameters and liner performance requirements are specified.

Mitigation strategies in relation to saline dams are identified in the tenure specific Australia Pacific LNG Water Management Plans.

7.3.2 Soils

Contaminated soils will be assessed following the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Where remediation is required contaminated soils will undertake further assessment and remediated to site specific needs following the preferred order or options for site clean-up and management of a particular site:

- on-site treatment of the soil so that the contaminant is destroyed or the associated hazard is reduced to an acceptable level
- off-site treatment of excavated soil so that the contaminant is destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.

Purpose built soil remediation areas may be established for the remediation of contaminated soil from various locations. Dependent upon the preferred order for site clean up contaminated soils may be transported to the purpose built soil remediation area for remediation. Following the removal of contaminated soils visual inspections and contamination testing will be undertaken to confirm that all contaminated soil has been removed.

Subject to assessment, soil remediation strategies may include opportunities in:

- excavating contaminated soil and burying it at one location on site (this reduces the area containing contaminated soil)
- installing horizontal, vertical or reactive barriers
- constructing an engineered landfill cell on site (for situations with shallow groundwater, permeable soils, leachable contaminants or very high results)
- solidifying (locking contaminants in solidified matrix) or stabilising (converting contaminants to a less mobile and/or less toxic form, typically by chemical reaction) when contaminants are highly leachable, then incorporating with one of the above options
- land farming volatile contaminants and reusing soil on-site (if no sensitive receptors are nearby)
- land farming volatile contaminants at an offsite location then returning the soil to site
- on-site or off-site treatment, for example thermal desorption
- in-situ biological (e.g. air stripping, sparging or venting) or chemical treatments. These be considered for permeable soils but are usually slow processes.

Each soil remediation situation/task will be unique and an appropriate solution or combination will be utilized in accordance with site specific constraints.

8. Success Criteria

Rehabilitation success criteria are provided in the EA, Schedule of Rehabilitation conditions. Measurable success criteria have been developed based on model conditions for petroleum activities to reinstate and rehabilitate areas within the Gas Fields.

Reinstatement success is measured by the stability, drainage and soil environment that provides for a stable ground cover. Reinstatement success is the guiding requirement for the operational success of the asset in regard to the land management component of the infrastructure, and is measured by meeting the desirable success criteria in Table 9.

Final rehabilitation acceptance criteria site success is identified in comparison to adjoining vegetation assessment and/or analogue site baseline information measured at an RE reference site and is determined by meeting the measurable success criteria indicated in Table 10. Success criteria in relation to Rehabilitation types and MNES to address EPBC 2009/4974 Condition 15e are provided in Table 10.

8.1.1 Reinstatement and Operating Infrastructure criteria- Success criteria

Table 9: Reinstatement and Operating infrastructure measurable success criteria

Objective	Indicator	Measurable success criteria
All significantly disturbed areas no longer utilized for petroleum activities are reinstated within 9 months (3 months for pipelines)	Land is reinstated to the a stable non-polluting landform that either is consistent with surrounding landform contours or is another landform that is stable for operating purposes.	Rehabilitation monitoring as defined in Section 8 has confirmed all reinstatement has been completed within the 9 month (3 months for pipelines) time period.
Contaminated land is remediated	Land remediation plan implemented and no residual contamination present above trigger thresholds.	Plan implementation has been verified.

Objective	Indicator	Measurable success criteria
Areas are non-polluting, a stable landform and profiled contours are consistent to the surrounding landform or is otherwise stable for operating purposes.	Landform stability, and; Subsidence and erosion.	Reinstatement acceptance criteria has been met via rehabilitation monitoring defined in Section 8.
Surface drainage lines are established.	Stable drainage established.	
Topsoil is reinstated.	Topsoil has been returned to the disturbance area.	
Groundcover is present or an alternative soil stabilization methodology is employed and maintained.	Groundcover or other stabilisation method is present.	

8.1.2 Final Rehabilitation Acceptance criteria - Success Criteria

Table 10: Final Rehabilitation Acceptance measurable success criteria*

Requirement	Indicator	Measurable success criteria
≥ 70% of native ground cover species	A minimum 70% native ground cover is present when compared to the paired analogue site.	Monitoring program validates the indicator at the assessed location.
≥ total % ground cover	A minimum total percent ground cover is present when compared to the paired analogue site (e.g.: 30% vegetation cover at paired analogue would require a ≥ 30% ground cover on original disturbance)	
≤ % species richness of category 2-5 restricted invasive plant pest species	Species richness of category 2-5 restricted invasive plant species on the disturbance area is ≤ the paired analogue site	
≥ 50% of organic litter cover	A minimum 50% organic litter cover is present when compared to the paired analogue site.	
≥ 50% of total density of coarse woody material	A minimum 50% coarse wood material is present when compared to the paired analogue site or as presented in an analogue vegetation assessment of a comparable RE (Section 8). Whichever is the lesser value to account for land management over the time frame of the operation and follow up decommissioning/rehabilitation.	
All predominant species of the EDL that define the pre-disturbance RE(s) are present	All dominant species present in the recovering RE that form the EDL are present and healthy on disturbance as compared to the paired analogue site.	

*Any corrective action may be undertaken from monitoring or observation and will be managed in accordance with site specific or landholder requirements to rectify the issue via the Oracle Enterprise Asset Management System.

8.2 Monitoring and Compliance Reporting

8.2.1 Survey and Monitoring Prior to Construction

A pre-clearance ecological assessment will be undertaken prior to undertaking petroleum activities that involve significant disturbance to land to meet conditions under the various EA Schedule D conditions, following the methods outlined in the Protocol. The survey will be undertaken to ground truth and map REs and ESAs and confirm the location of EVNT listed flora and fauna species and MNES. This will include assessment of the condition, type and ecological value of any vegetation in any areas where significant disturbance is proposed to take place.

This assessment will be undertaken by a suitably qualified person and include the carrying out of field validation surveys, observations and mapping of any Category A, B or C Environmentally Sensitive Areas and the presence of species classed as endangered, vulnerable or near threatened under the *Nature Conservation Act 1992*.

If the assessment indicates that a Regional Ecosystem mapped as Endangered or Of Concern by the Queensland Herbarium is of a different conservation value classification, petroleum activities may proceed in accordance with the conditions of the relevant environmental authority based on the confirmed on-the-ground conservation value.

During the infrastructure planning phase, targeted threatened species surveys will be undertaken to confirm the absence or presence of threatened species and MNES in areas proposed to be disturbed as outlined in EPBC2009/4974 (Condition 5(o)) and outlined Section 7.2 of in the Protocol.

8.2.2 Monitoring of Areas of Conservation Significance

Monitoring the condition of EPBC and State listed species and communities and endangered regional ecosystems will be undertaken through assessment of representative monitoring sites located within 200m of major project disturbance activities. This will occur in accordance with the following procedure as outlined in Section 7.5 of the Protocol.

8.2.3 Remnant Vegetation Analogue Site Surveys

Information on the vegetation structure and species composition, including abundance, has been collected at established analogue (reference) sites as an information source to compare the effectiveness of rehabilitation efforts as necessary. Reference sites have been established and surveyed using the BioCondition reference site methodology (Eyre *et al.* 2006). Reference sites include pre-existing disturbances where this represents site conditions where Australia Pacific LNG will undertake activities. Reference sites have been selected to be representative of each of the Endangered, Of Concern, and Least Concern REs to be disturbed. At each reference site the following has been measured:

- the percentage foliage cover of tree and shrub species
- height of each vegetation stratum
- flora species richness and diversity, and
- fauna habitat features litter cover, fallen woody material (coarse wood debris) and the number of hollow logs.

The Queensland Herbarium's Methodology for the Establishment and Survey of Reference Sites for BioCondition (Eyre *et al.* 2006) has been used to select survey sites and for the survey of vegetation, along with fauna records (where observed) of the reference sites. This methodology requires that a minimum of three reference sites be set up and surveyed for each RE. Photo monitoring points are numbered, locatable by GPS.

Analogue survey data and results are found within the following documents:

- Analogue Sites – Combabula and Walloons Development Areas, Combabula Spur and Western HP Network (Q-1810-15-TR-0001)
- Rehabilitation Analogue Sites – Condabri Development Area, Australia Pacific LNG Mainline Pipeline – Hub to Midline Station and Eastern high Pressure Network (Q-1800-15-TR-0007)

8.3 Monitoring on the Completion of Reinstatement

A sign-off of the disturbance area is required on completion of development scope of work to ensure reinstatement or rehabilitation has been completed to the required standard and the site is in a state of progressive rehabilitation. The Reinstatement Field Inspection Checklists (FIC) and like documents are used for specific situations to verify reinstatement criteria has been achieved for land post infrastructure construction.

Infrastructure walk downs are another activity conducted by the construction contractor and Origin Energy/Australia Pacific LNG representatives to identify and address any land management defects post construction prior to completion of construction and handover of reinstated areas for ongoing operational use. On completion of construction reinstatement, monitoring will occur for the first 6 months followed by a follow up inspection at 12 months upon asset transfer to LNG Operations.

8.4 Monitoring During Operation

Monitoring will be required at various intervals for a range of parameters to ensure that reinstatement and operating infrastructure success criteria are progressing towards achievement targets. Monitoring intervals for operational monitoring and final rehabilitation monitoring (to meet final rehabilitation acceptance criteria) are distinctly different activities determined by both site specific rehabilitation requirements and infrastructure decommissioning and are identified for several variables and frequency of monitoring within Table 11 (reinstated landforms and progressive rehabilitation) and Table 12 (Final acceptance criteria for remnant ecosystems).

It must be acknowledged that monitoring the operational status of infrastructure is a different data set to monitoring the final acceptance criteria of decommissioned infrastructure. Assessment of remnant vegetation establishment, due to ongoing maintenance of infrastructure footprints will not occur until the infrastructure is decommissioned and a final rehabilitation objective can occur uninterrupted by petroleum activities. Furthermore it should be acknowledged that final rehabilitation objectives are impacted by landholder land management and property operations/management and potential success of rehabilitating remnant vegetation is closely tied to land management actions of the landholder and engagement actions between the landholder and Australia Pacific LNG.

A land holder sign off is necessary for rehabilitated infrastructure footprints to determine the maintenance requirements for land management are no greater than for surrounding areas, and obtain approval, in writing or recorded verbal acknowledgement, that land can be used for its pre-disturbance land use.

Where relevant, monitoring will involve comparison with data collected during pre-clearing surveys, analogue site survey data, monitoring of areas of conservation significance or assessment of adjoining land uses or ecosystems in comparison to the disturbance location (by Project and/or Operations).

Table 11: Operational monitoring (within Operations management) intervals/details for reinstatement and operating infrastructure success criteria

Rehabilitation Indicator	Baseline assessment post-handover to Operations (Year 1)	Year 2 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline)	Year 3 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline and Yr2)	Year 4 (Validation of Conforming sites and resurvey of Non-conforming and degrading sites from baseline, Yr2 and Yr3)	*Year 5 (Follow up assessment of baseline monitoring locations at 5 th year post Operations handover)
Ground cover species richness	All rehabilitation indicators to be assessed at desktop selected and ground truth monitoring points where a paired assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) location. Survey is to be undertaken as instructed in the Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029) dependent upon the site specific rehabilitation requirements and infrastructure decommissioning.				
Total ground cover percentage					
Category 2-5 restricted invasive plant species					
Category restricted invasive animal species					
Erosion and Subsidence					
Landform stability					
Watercourse bed and bank (where intersected by infrastructure)					
Landholder maintenance					
*Obtain Landholder validation of land use capability	Not required during these intervals/years, however landholders may request and be approved grazing access to infrastructure footprints.				*Required

*Landholder validation can occur to selected infrastructure or at the landholder property scale depending upon the infrastructure types to be assessed.

¹This validation will involve any infrastructure that has a desktop selected and ground truth point where a baseline assessment has been conducted. Consideration is required to staggered development of infrastructure due to the progressive development of the gas fields.

Table 12: Final Rehabilitation Acceptance monitoring intervals and details of monitoring for final acceptance rehabilitation success criteria at remnant vegetation recovery areas

Rehabilitation Indicator	Baseline assessment post decommissioning (Year 1)	From Baseline assessment determine management inputs	Year 2 (Only sites that are decommissioned and have not met final acceptance criteria at the baseline assessment)	From Year 2 assessment determine management inputs	Year 3 (Only sites that are decommissioned and have not met final acceptance criteria at the Year 2 assessment)
Ground cover species richness	As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029). No further monitoring will be required if the site assessed meets the rehabilitation indicators where a paired analogue assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) remnant vegetation location	Further time for regeneration or management inputs (e.g.: tubestock planting of EDL species) may be necessary to meet the Final rehabilitation acceptance criteria as stated in the tenure specific EA. A site specific management outcome will be determined from the baseline assessment and implemented as required.	As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029). No further monitoring will be required if the site assessed meets the rehabilitation indicators where a paired assessment is undertaken determining a comparison of indicators on disturbance and at an undisturbed (by Project or Operations) remnant vegetation location	Further time for regeneration or management inputs (e.g.: tubestock planting of EDL species) may be necessary to meet the Final rehabilitation acceptance criteria as stated in the tenure specific EA. A site specific management outcome will be determined from the baseline assessment and implemented as required.	As per Rehabilitation Survey Procedure (QLD-1000-ENV-PRO-00029)
Total ground cover percentage					
Category 2-5 restricted invasive plant species					
Organic litter cover percentage					
Coarse woody material cover assessment					
Predominant species of the EDL for the RE assessed					

8.5 Data Management

Australia Pacific LNG will set up a data management system that will include:

- a GIS data management system with the GPS location of every rehabilitation monitoring point stated in Tables 11 and 12 of Section 8 and retain data schemas for variables monitored at an assessed point
- rehabilitation monitoring survey procedures to ensure all operational rehabilitation monitoring actions stated in Tables 11 and 12 of Section 8 are recorded in GIS at every monitoring point
- a photographic record of rehabilitation monitoring with the GPS locations and direction of orientation of photo monitoring points*, and;
- Document management systems operating as an information storage.

*Currently stored in Open Text document control system under Operations HSE.

8.6 Compliance Reporting, Contents and Frequency

8.6.1 Record of Impacts to MNES

If an impact occurs (which may include a presumed impact where a species is presumed to be present) to a MNES during Gas Field development, operation, or decommissioning the Australia Pacific LNG will record the impact, (as required by EPBC 2009/4974 Condition 13 a) by reference to the:

- location, specific site and type of infrastructure or activity
- each MNES subject to disturbance
- the related site assessment or field ecological survey documentation and recommendations, or the decision that the particular MNES was presumed to be present
- the total disturbance limit
- the remaining disturbance limit for each affected MNES
- the reason for the decision, including justification for the action taken, description of the efforts to avoid the impact, and an explanation why other constraints might justify the impact on the MNES, and;
- actions and commitments by the Australia Pacific LNG to remediate, rehabilitate, or make good any unauthorized disturbance.

This information must be recorded to a standard that can be independently audited.

8.6.2 Annual Environmental Return

An Annual Environmental Return will be provided to DoEE which will address compliance with EPBC 2009/4974, Conditions 112 and 113 and contains the following:

- records any unavoidable adverse impacts to MNES
- outlines mitigation measures applied to avoid adverse impacts on MNES
- outlines any rehabilitation work undertaken in connection with any unavoidable adverse impact on MNES
- identifies all non-compliances with DoEE conditions, and;
- identify any amendments to plans (including this RRRMP) to achieve compliance with EPBC 2009/4974 conditions.

8.6.3 Environmental Authority Reporting

An annual monitoring report will be prepared and submitted to the administering authority (DEHP) upon request as required under the various EA Schedule A requirements. This submission will cover reporting on the rehabilitation monitoring required under various rehabilitation EA Schedule requirements.

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10. Document information and history

DOCUMENT CUSTODIAN GROUP

Title	Name/s
IG-Operations-APLNG-HSE	Andrew Beckman, Stuart Fletcher, Adrien Woerhle

DOCUMENT AUTHOR

Position	Name
Senior Environment Advisor	Adam Christison

DOCUMENT HISTORY

Rev	Date	Changes made in document	Reviewer/s	Consolidator	Approver
1	24/08/2011	Issued for Use	Trevor Meers/Stephen Catchpoole	Justin Claridge	
2	15/09/2011	Issued for Use	Trevor Meers/Stephen Catchpoole	Justin Claridge	
3	12/06/2013	Issued for Use	A Christison	T Wearing R Pappalardo	M Dreyer
4	12/09/2013	Issued for Use	A Christison	B Campbell A Walter	M Dreyer
5	10/04/2014	Issued for Use	A Christison	B Campbell R Pappalardo	M Dreyer
6	28/03/2017	Issued for Review	A Christison	A Christison	Adrian Woehrle
7	06/09/2017	Updated to include the Riley block EA	A Christison	A Christison	Andrew Beckman

Appendix A Statutory Declaration of a suitably qualified person

Oaths Act 1867

Statutory Declaration

QUEENSLAND
TO WIT

I, Adam David Christison


of Level 6 135 Coronation Drive, Milton, Queensland, 4064. in the State of Queensland

do solemnly and sincerely declare that

I am a Suitably Qualified Person to prepare the Condabri Rehabilitation Plan. In preparing the aforementioned written document CDN/ID 12746063 I declare that:

1. All relevant material has been considered in the written document CDN/ID 12746063
2. That the content of the written document is accurate and true
3. That the written document meets the requirements of the relevant condition of the environmental authority

And I make this solemn declaration conscientiously believing the same to be true, and by virtue of the provisions of the Oaths Act 1867.




Signature of declarant/deponent

Taken and declared before me at 135 Coronation Drive Milton Queensland 4064

this 7th day of July 2017

SAWY
SHAM & NEW
JP QUAZ

A Justice of the Peace/Commissioner for Declarations.



Appendix B Resume of a suitably qualified person

Resume - Adam Christison | 2016

Adam Christison

SENIOR ENVIRONMENT ADVISOR - Rehabilitation

Profile

I have obtained over fourteen (14) years of experience through various public and private sector roles obtaining a wide range of skills in botanical, ecological, pest management and conservation disciplines. I have successfully completed a Bachelor of Applied Science (Protected Area Management) in 2002 and in 2016 completed a Masters in Environmental Management (Conservation Biology).

Following completion of an undergraduate degree I commenced my professional career within the Queensland Department of Primary Industries and Fisheries in the field of pest management working in an Inspectors role for a state quarantine program. Here I was responsible for providing advice, direction and auditing compliance of and to private and public stakeholders in pest management and quarantine.

Taking a progressive career step I started in conservation roles firstly as a pest and land management inspector with Redland Shire Council providing advice and direction for land managers on the control of declared weed species and the development of fire management infrastructure. Following this role I spent five (5) years with the Pine Rivers Shire Council and Moreton Bay Regional Councils in a role as Bushcare Officer which drove the conservation effort within the local Council. This role was an extension service to landholders providing direction for conservation based land management and property planning as well as the support and direction of volunteer groups in delivering on ground conservation outcomes. The role also operated as a service provider internally to deliver on ground species specific conservation efforts in regard to negotiation, planning, budgeting, project management, maintenance planning and coordination of delivery.

Currently I am employed as a Senior Environment Advisor - Rehabilitation with Origin Energy (5 years) where my role is to provide rehabilitation monitoring services and advice internally within the business to drive compliance with environmental authorities on rehabilitation objectives. In this role I deliver an advice service to internal stakeholders (both development and operation) in regard to rehabilitation (land management, soil management, vegetation management, pest management) and rehabilitation monitoring; with direction to the data gathering to meet environmental approvals requirements. My unique exposure to field activities, planning tasks and extension services on rehabilitation topics to an array of internal and external customers has provided a broad skill set for addressing environmental management issues in regard to land rehabilitation.

Qualifications

- 2016 - Master of environmental Management (Conservation Biology), University of Queensland, St Lucia, Queensland.
- 2014 - Graduate Diploma - Environmental Management, University of Queensland, St Lucia, Queensland.
- 2011 - Graduate Certificate - Environmental Management, University of Queensland, St Lucia, Queensland.
- 2002 - Bachelor of Applied Science (Protected Area Management), University of Queensland, Gatton, Queensland.

Affiliations

EIANZ
SQLRG

Environment Institute of Australia and New Zealand Member
Southern Queensland Land Rehabilitation Group Member

Career Summary

2011 - Present

Senior Environment Advisor - Rehabilitation, **Origin Energy, Milton and Regional Queensland.**

2006 - 2011	Bushcare Officer, Pine Rivers Shire Council/Moreton Bay Regional Council, Strathpine, Queensland.
2005 - 2006	Inspector - Pest Management, Redland Shire Council, Cleveland, Queensland.
2002 - 2005	Inspector - Pest Management and Quarantine, Queensland Department of Primary Industries and Fisheries (QDPI&F), Oxley, Queensland.

Areas of expertise

- Land Management -land management/property management for rehabilitation, conservation and monitoring
- Botany - plant identification, propagation and delivery of survey
- Ecology - vegetation assessments and surveying, and;
- Pest Management - experience with the delivery of pest quarantine, control and management

Industry experience

Land Management experience

Land Rehabilitation, Moreton Bay Regional Council. Proposed Koala Conservation offset at Petrie, North Brisbane, Queensland. I was responsible for coordinating and undertaking site vegetation and fauna surveys, site planning, project delivery and follow up site management to deliver a quality patch of vegetation and habitat for local Koala populations to a specific project budget.

Land Rehabilitation, Moreton Bay Regional Council. I was responsible for the delivery of conservation efforts via volunteer support to protect and enhance bushland within the ownership of Moreton Bay Regional Council.

Rehabilitation monitoring, Origin Energy. I was responsible for field assessment and reporting on land rehabilitation post reinstatement to both record rehabilitation progress and provide advice in locations requiring maintenance.

Botany/Ecology experience

Analogue Vegetation Surveys, Origin Energy. In addressing Environmental Authority conditions for rehabilitation, I was responsible for coordinating, planning and directing the survey of 36 Regional Ecosystems (RE) (108 locations) and delivering field investigations and reports of vegetation community impacted by development. The information is available to inform land rehabilitation of remnant REs.

Extension Service, Moreton Bay Regional Council. Survey of conservation sites in and around the Moreton Bay Regional Council area of responsibility. Providing identification service for flora and fauna species in diverse communities from temperate riparian rainforest to coastal mudflats.

Pest Management experience

Quarantine Inspections, Redland Bay Shire Council. I was responsible to survey land and provide control advice to landholders public and private on strategies to meet compliance requirements for the management of declared pests and fire management.

Quarantine Inspections, QDPI&F. I was responsible to consult large and small business as well as public and private entities, providing advice and management options as well as auditing to/of landholders and businesses on preventative and control strategies to meet compliance requirements for the quarantine management of invasive pests.