DBNGP Looping 10 Project

Assessment of the Referral Information (ARI) Summary

November 2005

DBP has contracted Alinta Network Services to conduct the operation, maintenance and construction of the pipeline

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Preamble

DBNGP (WA) Nominees Pty Limited (DBNGP (WA) Nominees) is proposing to construct a 23km looped pipeline adjacent to the existing underground gas transmission pipeline within the Dampier to Bunbury Natural Gas Pipeline (DPNGP) corridor. Looping is best described as a process of duplicating an existing pipeline between compressor stations for a certain distance. Once the specified distance is reached it then ties back to the parallel pipeline. The consequence of this design results in an increase in the gas flow rate as well as increasing the volume of gas stored within the pipeline infrastructure.

The purpose of this document is to support the Assessment on Referral Information by summarising the main environmental issues and providing details on the environmental management procedures that will be implemented to minimise any impacts that the project is likely to have on the environment.

The 23km 'Looping 10' Pipeline is of strategic economic importance to the State of Western Australia as it is designed to increase the supply of natural gas into the south-west of Western Australia where the demand for gas by the both the household and commercial sectors is increasing.

Summary of Key Proposal Characteristics

Element	**Description**
Proponent	DBNGP (WA) Nominees Pty Limited
Location	Start at Kwinana Junction, Kwinana and traverse 23km in a S and SE direction. End in Hopelands, Shire of Serpentine / Jarrahdale, Western Australia
Proposed Action	Construct a buried 660mm diameter pipeline adjacent to the existing DBNGP. This pipeline will be looped to the existing DBNGP to increase flow of natural gas.
Route Alignment	The pipeline will commence at Kwinana Junction MLV 139, north of Thomas Road. The route traverses south through the Leda area and Leda Nature Reserve. The pipeline route bends east at Mundijong Road, and traverses towards a south easterly direction prior to Baldivis Road, crossing the Kwinana Freeway and Serpentine River. The tie in point will be in Hopelands, between Punrak Road and Henderson Road, west of Hopelands Road, Western Australia.
Route Length	23km
Proposed Tenure	The pipeline will be constructed wholly within the existing DBNGP easement which is gazetted under the *DBP Act* 1997.
Temporary Disturbance Area	69ha
Area of Temporary Vegetation Clearance	22.2ha
Maximum Length of Trench Open	The length of trench to remain open will be maintained at around ten times the expected production rate and will typically be seven km. If rocky country is identified ahead, the spread in this area will typically be opened up ahead of normal.
Construction Duration	4 months

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1 Introduction

1.1 Background

DBNGP (WA) Nominees Pty Limited (DBP) is proposing to construct and operate an underground gas transmission pipeline (known as “Looping 10”) within the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) corridor from Kwinana Junction in Kwinana to Hopelands (between Punrak Road and Henderson Road), west of Hopelands Road, Western Australia.

Alinta Network Services Pty Ltd (ANS) is the Project Manager for the work under contract to DBP.

The proposed 660 mm pipeline will be approximately 23 km long. This pipeline will be looped to the existing pipeline. Looping is best described as a process of duplicating an existing pipeline between compressor stations for a certain distance. Once the specified distance is reached it then ties back to the parallel pipeline. The consequence of this design results in the gas flow rate being increased as well increasing the volume of gas stored within the pipeline infrastructure.

Standard pipeline construction practices will be adopted for the proposed Looping 10 pipeline. Construction techniques will be in accordance with the Australian Pipeline Industry Association (APIA) *Code of Environmental Practice*.

1.2 Proponent details

DBNGP (WA) Nominees Pty Limited is the proponent for this project.

In October 2004 the Dampier Bunbury Natural Gas Pipeline was purchased by the current owners, a consortium made up of Diversified Utility and Energy Trusts No. 1 and 2 (collectively referred to as DUET) who own 60%, and Alcoa and Alinta Limited (ALN) who own 20% each. Dampier Bunbury Pipeline (DBP) is the trading name of the DBNGP group of companies ultimately owned by the consortium.

DBP was established to take responsibility for the management of the pipeline’s commercial and regulatory interests and to ensure that no conflicts of interest exist. Apart from that day-to-day management of the pipeline is the responsibility of Alinta Network Services Pty Ltd (ANS) as the operator pursuant to an operating agreement between ANS and DBP.

Under the terms of the operating agreement ANS is the asset manager of the pipeline for all aspects other than commercial and regulatory. ANS provides operations, maintenance and construction services to DBP, as well as support functions such as Finance, Legal, Human Resources and IT support. ANS is one of Australia's leading managers and operators of both gas transmission pipelines and distribution networks, with operations in Queensland, New South Wales, Victoria, Tasmania and Western Australia. ANS is skilled in the planning, design and construction of pipelines and facilities. Maintenance work is carried out on behalf of ANS by National Power Services, also part of the Alinta group, focussed on the expert delivery of maintenance services to the utilities sector.

1.3 Purpose of this Document

The purpose of this document is to support the Assessment on Referral Information by summarising the main environmental issues associated with the project and outlining the environmental management measures that will be utilised to minimise any impacts on the environment.

1.4 Structure of the Referral Document

This document provides an overview of the main environmental issues associated with the project and the proposed management measures to be implemented to minimise the identified potential impacts. The document is divided into a number of sections to address these issues:

Section 2 – Provides a description of the project

Section 3 – Provides a description of the environment in which the project will take place including ecological, social and economic factors

Section 4 – Provides a description of the environmental risk assessment process that was undertaken for the project

Section 5 – Provides an overview of the potential environmental impacts associated with the project and the management measures that will be implemented to mitigate these impacts

Section 6 – Provides information of the stakeholder consultation that has been undertaken to date for the project

Section 7 – Provides an outline of the environmental management system and performance indicators that will be used to assess the level of compliance with the identified environmental management measures for the project.

1.5 Approval Process

The construction of gas pipelines in Western Australia is regulated under the *Petroleum Pipelines Act 1969* and an amendment to the existing DBNGP licence will be required for this proposal. Licence conditions require that both construction and operations Environmental Management Plans (EMPs) be developed and implemented. Activities in the existing DBNGP Corridor are covered by the *Dampier to Bunbury Pipeline Act 1997*.

The proposal will also have to comply with the requirements of the E*nvironmental Protection Act 1986,* including the submission of a referral for the proposed pipeline to the Minister for the Environment under section 38 of the Act. The proposal will also comply with the requirements of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* if the project is not formally assessed and the *Wildlife Conservation Act 1950*.

Approvals are required from the following agencies prior to commencement. Looping 10 approvals include (but are not limited to):

Table 1-1: Relevant Approvals Processes

Phase	Legislation	Jrsdn	Agency	Approvals Process
Planning	*Environmental Protection and Biodiversity Conservation Act 1999*	Cwth	DEH	EPBC Referral-submitted 18th July 2005
Planning	*Environmental Protection Act 1986*	WA	EPA	Part IV - S 38
Planning	*Rights in Water and Irrigation Act 1914*	WA	DoE	Permit/Licence to undertake dewatering
Planning	*Environmental Protection Act 1986* (In event that S 38 formal impact assessment is not triggered and proposal is not assessed formally)	WA	DoE	Vegetation Clearing Permit (S 51)
Planning	*Rights in Water and Irrigation Act 1914* (in event that open cut techniques are used) *Rights in Water and Irrigation Regulations 2000*	WA	DoE	Permit/Licence to modify banks (if such works undertaken).
Planning/ Construction	*Petroleum Pipelines Act 1969*	WA	DoE/ DoIR	Pipeline Licence, CEMP, Operation EMP
Planning	*Aboriginal Heritage Act 1972*	WA	DIA	S 18 Application
Planning	*Dampier Bunbury Pipeline Act 1997*	WA	DPI	S 34 Application (in place) S41 – approval for additional land within the DBP corridor
Planning	*Land Administration Act 1997*	WA	DPI	S91 – approval for additional land outside the DBP corridor
Planning	*Common law agreements*	WA	Individual land owner	Approval for additional land outside the DBP corridor (not Crown Land)
Planning	*DBP Act 1997*	WA	DPI	S 34 Application (in place)
Planning	*Wildlife Conservation Act 1950* (in event that DRF or PF are in the ROW)	WA	CALM	If avoidance is not practicable then a Permit to take fauna, DRF/PF may be necessary

2 Project Description

2.1 Location

The pipeline will commence at Kwinana Junction MLV 139, north of Thomas Road and extend in a southerly direction for 23 km. The route runs parallel with the old Fremantle Rockingham Hwy crossing Gilmore Ave and traverses south through the Leda area and Leda Nature Reserve. It then crosses Millar Rd West and bends east at Mundijong Rd, running parallel with Mundijong Rd for approximately two kilometers, before turning south-east under Baldivis Road, crossing the Kwinana Freeway, east of Folly Pool, and the Serpentine River. The tie in point will be in Hopelands, between Punrak Road and Henderson Road, west of Hopelands Road, Western Australia. The location of the project is shown in Figure 1a of Appendix 1.

2.2 Land Tenure and Land Use

DBP is the owner of the existing DBNGP. While some construction activity will take place outside the DBNGP Corridor the actual looping pipeline section will be constructed within the DBNGP corridor. The corridor was established in the early 1980's and formally gazetted under the *Dampier to Bunbury Pipeline Act* 1997 (DBP Act).

The area impacted by the proposal is approximately 69 ha. The pipeline traverses mainly through cleared agricultural properties, with a smaller proportion traversing through public open space (Leda Nature Reserve and surrounds), remnant vegetation on private property (Lowlands Bushland, Western Block) and road/rail easements.

In certain sections the construction activity will extend outside of the existing corridor (eg turnaround areas). Where construction activities extend outside the existing corridor approvals to access the land will be sought under Section 91 of the *Land Administration Act* 1997 or Section 41 of the DBP Act of through agreements with landowners.

2.3 Construction Methodology

The proposed Looping 10 project involves the construction and operation of 23km of 660mm pipeline. The pipeline engineering and design features are contained in Table 2-1.

Table 2-1: Pipeline Engineering and Design Features

Design Element	Details
Length	23 000m
Diameter (outside)	DN660
Wall Thickness	8.72 mm
Pipe quality	API 5L Grade X 70
Factory Coating	1.85mm trilaminate
Pipeline Content	Natural Gas
Operational Pressure	6.84 MPag
Maximum Allowable Operating Pressure	10.2 MPag
Hydrotest Pressure	12.75 MPag
Design capacity	127 TJ/day
Standard Corridor Width	30m
Minimum depth of cover	1000mm

Corrosion Protection	Impressed current cathodic protection
Non-destructive Testing	100% Xray
Buried marker tape	As specified by AS 2885 Risk Assessment
SCADA	SCADA communications to be Modbus RTU protocol

There are several road and other infrastructure crossings that will be carried out in accordance with local municipality requirements, together with the APIA *Code of Environmental Practice (1998)* and *AS 2885.1*.

Pipeline construction will be carried out within the existing 30m wide corridor using a production line approach. However, the footprint of the Area of Disturbance (AOD) for this project will be 23.5m except in environmentally sensitive areas where it will be reduced to 20m.

The length of trench to remain open will be maintained at around ten times the expected production rate and will typically be seven km. If rocky country is identified ahead, the spread in this area will typically be opened up ahead of normal. At all times, the length of trench open will be that which can be effectively serviced by the fauna management team. The depth and width of the trench will typically be 1.7 m to 2.0 m and 2.0 m respectively.

A number of specialised crews pass along the corridor, fabricating and installing the pipeline then backfilling and rehabilitating the AOD. The pipeline will be constructed and operated in accordance with the requirements of *AS2885 Pipelines — Gas and Liquid Petroleum* and the APIA *Code of Environmental Practice.* Looping 10 pipeline construction activities are summarised in Table 2-2.

Watercourses may be crossed using either open trench or horizontal directional drilling (HDD) methods depending on the outcome of any site specific feasibility studies. The only significant river crossing is the Serpentine River which will be crossed using the HDD method.

The construction workforce is expected to consist of approximately 100 people, including the project management and pipe supply/distribution personnel. Not all persons will be present at any one time.

Table 2-2: Pipeline Construction Sequences

Activity	Description
Detailed Survey	Engineering, environmental and cultural heritage surveys are conducted for route selection and to determine if any special construction techniques or mitigation measures are required. Once the preferred pipeline route has been determined this is complete, then the centreline is surveyed and engineering aspects are finalised. Markers (pegs) are placed to identify pipeline route and AOD.
Fencing	Severed fences are replaced with temporary construction gates for both property boundaries and internal fences. (Security of paddocks will be maintained).
Clear and Grade	Graders and bulldozers are used to clear a 22m wide area to provide for construction activities. This clearing will be within the 30m AOD. The remaining 8m wide area will be used to store topsoil and cleared vegetation. Topsoil will typically be graded to a depth of 50mm to 100 mm.
Trenching	A trench is dug for the pipeline either by a trenching machine or excavator. The trench will be monitored daily for fauna entrapment, and appropriate fauna shelter provided.
Stringing	Steel pipe is trucked to the construction site in sections, each approximately 18 metres long. These are then laid end-to-end next to the trench alignment. The sections are placed on sandbags that are raised on blocks or wood (timber skids), to protect the pipe.

Activity	Description
Bending	Where required, pipe sections are bent to match changes either in elevation or direction of the route.
Welding	Pipe sections are welded together.
Non Destructive Testing	The welds are inspected using x-ray or ultrasonic as per AS 2885.2-1995.
Joint Coating	The area around the weld is grit blasted and coated with a protective coating to prevent corrosion.
Padding	Where required, padding machines are used to sift the excavated subsoil to remove coarse materials. To protect the pipe coating the remaining fine material is used to pad beneath and on top of the buried pipe. In some instances (e.g. very rocky soils) imported sand or foam pillows are used for bedding under the pipe.
Lowering-in	Sidebooms or excavators are used to lower the welded pipe into the trench.
Backfilling	Trench spoil (subsoil and topsoil) is returned to the trench and material compacted to minimise risk of subsidence of material over the pipe.
Pressure Testing	Pipeline integrity is verified using hydrostatic testing in accordance with AS 2885.5. During hydrostatic testing the pipeline is capped with test manifolds, filled with water and pressurised up to 125% of operating pressure for a minimum of two hours. A 24-hour leak test or a 3-hour combined strength and leak test then follows. Providing it meets water quality guidelines and has landholder approval, hydrotest water is discharged to the surrounding environment.
Restoration and Rehabilitation	The easement is recontoured to match surrounding landform and erosion controls constructed where appropriate. Separately stockpiled topsoil is then respread evenly across the AOD and any cleared vegetation placed across the AOD, to assist in soil retention and provision of seed stock. Where necessary, to restore vegetation cover, reseeding or revegetation of the AOD using appropriate species (i.e. indigenous species) may be undertaken.
Signage	Marker signs are erected along the easement as per AS 2885.1-1997.

2.3.1 Horizontal Directional Drilling

At the sites where horizontal directional drilling (HDD) is undertaken an area will be required to temporarily house the drill rig. The drill site area for the HDD from an operational and safety perspective is usually 50 meters x 50 meters in area and incorporates an area for the positioning of the drilling rig, an area for the management of the drill mud (ie. sumps) and a safe truck turnaround/manoeuvring area. The site where HDD will be undertaken is the Serpentine River.

The HDD drilling mud disposal requirements include the construction of evaporation dams at the HDD entry and exit locations where the mud will be stored until such time as the mud is dry. At this point the mud will then be loaded into tip trucks and disposed of at a suitable approved land fill/waste disposal site. The HDD pad will be reinstated in accordance with the project CEMP commitments.

2.3.2 Pressure Testing

Pressure testing of the pipeline will require the sourcing and disposal of ‘hydrotesting’ water.

2.4 Alternative Options Considered

The design for this looping project is to run the new pipeline parallel with the existing DBNGP and tie in at a location 23km south east of Main Line Valve (MLV) 139. The corridor is

designed to contain more than one pipeline. In 2003 the Western Australian Government appointed the Gas Pipeline Working Group to consider additional corridor options for future new pipeline construction. In the area for the looping project there was no additional land purchased by the Western Australian Government to provide alternate corridor options. The new looped pipeline has therefore been designed to maximise the use of the existing DBNGP Corridor by providing the equivalent of four times the capacity of the existing pipeline in one larger pipeline therefore negating the need for several smaller pipelines.

DBP is the owner of the existing DBNGP. The Looping 10 pipeline will be constructed within the DBNGP corridor established in the early 1980's and gazetted under the *Dampier to Bunbury Pipeline Act 1997* prior to the privatisation of the pipeline.

The Act provided for the DBNGP Land Access Minister to confer rights in respect of land in the Corridor for the purpose of:

(i) having, constructing, or operating, on the DBNGP corridor any pipeline for transporting gas or

(ii) enhancing any pipeline referred to in subparagraph (i)

The Information Memorandum that was prepared by the State of Western Australia for the sale of DBNGP makes the following statements in relation to the corridor:

> *8.2.1.1 The responsible Minister will have access rights which allow for the operation, maintenance, and enhancement of the DBNGP, as well as access rights to construct additional pipelines within the DBNGP Corridor.*
>
> *8.4.2.1 The Initial Access Licence will be issued to AlintaGas by the responsible Minister and assigned to the Acquirer by AlintaGas as part of the DBNGP Sale. The Initial Access Licence will grant access to the DBNGP Corridor as necessary to allow for the ownership, operation and maintenance of the DBNGP and its related facilities.*
>
> *8.4.2.2 The responsible Minister will grant an Access Licence or Access Licences granting access to the DBNGP Corridor, which may in aggregate be over its full length, to allow for the enhancement of the DBNGP (which may initially be by AlintaGas or subsequently by the Acquirer) through looping and compression or the construction of an independent pipeline, each to be placed and constructed within the DBNGP Corridor in accordance with best gas industry practice so as to best utilize the available space.*

3 Environmental Description

3.1 Regional Setting

The Looping 10 Project is located in the Swan Coastal Plain Bioregion. The existing environmental aspects of the project location are provided in Appendix 1(b).The first 11km of the proposed route traverses the Leda bushland area and the Leda Nature Reserve. The remainder of the proposed route pass through predominantly cleared agricultural land. As a result, there are low population densities along the route. The low population density combined with the short duration of disturbance during the construction period should result in minimal impacts upon local residents.

3.2 Climate

The area has a typically Mediterranean climate with generally hot dry summers and cool wet winters. Summer weather patterns are typically dominated by high pressure systems resulting in easterly breezes in the mornings followed by south westerly sea breezes of an afternoon. The winter weather patterns are dominated by low pressure systems and cold fronts resulting in an increase in rainfall and winds predominantly from the south west.

Climate date from the Bureau of Meteorology[1] for the Medina Research Centre is summarised in Table 3.1. The Medina Research Centre is located 4km from the coast and directly adjacent to MLV 139, the start of the Project. The start of construction is planned for January 2005 and will take approximately 4 months to complete.

Table 3-1: Medina Research Centre Climate

Item	Jan	Feb	Mar	Apr	May	Jun
Mean daily Max Temp (^{o}C)	30.4	31.3	29.0	25.8	21.9	19.3
Mean No. Days >= 30 (^{o}C)	15.5	16.9	12.2	4.2	0.3	0.0
Highest Max temp (^{o}C)	44.9	45.8	43.0	35.5	32.9	26.2
Mean daily Min temp (^{o}C)	16.6	17.2	15.6	13.5	10.5	9.2
Mean Daily Evaporation (mm)	8.5	8.0	6.2	4.0	2.3	1.8
Mean rainfall (mm)	10.5	23.1	21.6	38.3	101.8	156.1
Mean No of rain days	2.6	2.2	4.9	7.5	12.7	17.5
Highest monthly rainfall (mm)	86.2	246.5	67.4	114.0	226.9	250.8
Lowest monthly rainfall (mm)	0.0	0.0	1.3	3.20	34.7	74.2

Based on wind data from Perth Airport the 9am annual wind rose is dominated by easterly winds whilst the 3pm annual wind rose shows predominantly westerly and south westerly wind directions.

Evaporation data from the Medina Research Centre is provided below in Table 3.2 (BOM 2005). The data shows that average monthly rainfall exceeds average monthly evaporation only during the four months of May to August.

[1] www.bom.gov.au

Table 3-2: Rainfall vs Evaporation

Month	Medina Research Centre	
	Avg Rainfall (mm)	Avg Evaporation (mm)
January	10.5	263.5
February	23.1	224
March	21.6	192.2
April	38.3	120
May	101.8	71.3
June	156.1	54
July	156.6	55.8
August	119.2	71.3
September	79.8	96
October	42.9	145.7
November	34.4	195
December	8.7	244.9

Climate is an important consideration when scheduling pipeline construction. Extreme climatic conditions including rainfall and wind speed need to be taken into account and construction scheduled and managed accordingly. In particular, very heavy or prolonged rainfall and wet conditions are directly associated with most potential environmental impacts on the AOD including soil erosion and flooding. These impacts and potential mitigation measures are dealt with in Sections 5.

3.3 Geology and Soils

The project area is located entirely on the Swan Coastal Plain. The first 11kms of the pipeline lie on the coastal sand dunes (Spearwood Dunes) and limestone deposits (Tamala Limestone). The last 12km of pipeline traverses the Bassendean Dune system (the oldest and the furthest inland of the three dune systems occurring on the Swan Coastal Plain) and areas where the Bassendean sands overlay the Guildford Formation which is a clay-based sediment formed of clay-based soils. This unit is less permeable than the Bassendean Sands and may result in a perched water table.

Subsurface conditions along the proposed route are dominated by unconsolidated dune sands and mixtures of alluvial sand, silt and clay (BBG 2004). However, small areas of rock or cemented soils may be encountered in the following situations:

- during the first 11km in areas containing tamala limestone, medium to high strength limestone caprock may be encountered
- in areas of thin bassendean sand and swamp deposits, isolated areas of generally low strength iron oxide cemented sand colloquially referred to as “coffee rock” may be encountered
- indurated alluvium generally massive and of low to medium rock strength may also be encountered in isolated areas.

All of these areas are considered suitable for excavator, rock saw or rock breaker techniques and it is not anticipated that there will be any requirement for blasting along the corridor (BBG 2004).

All of the soil types within the proposed route are prone to wind erosion if denuded and water erosion can occur on any soil type however it is dictated by the degree of runoff and soil

detachment. Water erosion will most likely occur on areas such as steep slopes and along drainage pathways (BBG 2004).

An Acid Sulphate Soils (ASS) assessment was undertaken to predict the acid generating potential of soils encountered along the proposed route. The first 10km of the pipeline route is predominantly low risk of containing ASS or Potential Acid Sulphate Soils (PASS) with the exception of the area between kilometre point (KP) 3 and 4 which was classified as medium risk due to the water table being between 1 and 5 m below ground. Due to the soil types and shallow depths to groundwater the remainder of the proposed route was predominantly classified as medium risk with only 1.8 km classified as high risk (PB 2005).

The areas classified as high risk, totalling 1.8km were:

- KP 12.4 – KP 12.5
- KP 14.5 – KP 14.6
- KP 17.2 – KP 18.6
- KP 19.9 – KP 20.0
- KP 22.4 – KP 22.5

3.4 Watercourses

3.4.1 Groundwater

Groundwater is not likely to be intersected for the first 11km of pipeline construction due to the large depths to groundwater in the Spearwood Dunes and Tamala Limestone. However, groundwater may be intersected within areas of low lying Bassendean Sands, and Swamp deposits (BBG 2004).

3.4.2 Wetlands

The definition of a wetland that has been adopted in the Wetland Conservation Policy for Western Australia (CALM 1997) is ‘an area of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres’.

There are more than 9,600 wetlands, covering over 362,000 ha on the Swan Coastal Plain. The wetlands include 200 lakes which hold permanent water, swamps that contain water during winter and spring and damplands which have waterlogged soils in the wet seasons. Many of the wetlands are windows to the underlying groundwater where the land dips below the watertable. These wetlands provide a very important habitat for a large number of plants and animals. Some are also used as a water source for town water supplies (Balla 1994).

The classification system employed for wetland classification on the Swan Coastal Plain classifies wetlands based on landform and water permanence, the various types of which are presented in Table 3-3 below. There are three categories of wetlands depending on the level of management applied (Hill et al 1996).

Table 3-3: Classification of Wetlands

Wetland Type	General Description
Basin Wetlands	Dampland= seasonally waterlogged basin Sumpland= seasonally inundated basin Lake= permanently inundated basin Artificial basins (eg dams, reservoirs)
Flat Wetlands	Floodplain= seasonally inundated flat Palusplain= seasonally waterlogged flat

Table 3-4: Wetland Management Categories

Management category	General Description	Management Objectives
C-Conservation	Wetlands support a high level of ecological attributes and functions	Highest priority wetlands Reservation in national parks, crown reserves and State owned land Protections under Environmental Protection Policies Wetland covenanting by landowners.
R- Resource Enhancement	Wetlands which may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category. This can be achieved by restoring wetland structure, function and biodiversity. Protection is recommended through a number of mechanisms.
M- Multiple Use	Wetlands with few important ecological attributes and functions remaining	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through land care. Should be considered in strategic planning (eg drainage, town/land use planning.

Although the pipeline AOD does not traverse any wetlands for the first 11 km there are three Conservation Category wetlands located 200m to the west of the pipeline AOD and one small Conservation Category Wetland 10m to the west of the pipeline AOD at KP 7.1. After KP 11 the pipeline AOD traverses predominantly Multiple Use wetlands. These areas are mainly cleared residential acreage blocks. The proposed route also either traverses or is aligned in close proximity to 6 Resource Enhancement Wetlands, 3 Conservation Category Wetlands and 4 Environmental Protection Policy wetlands. The aerial photos together with the respective wetland classifications are shown in Appendix 2 as Figures 1-7.

There are no wetlands listed for protection under the JAMBA and CAMBA agreements, RAMSAR Convention or ANCA identified wetlands within 2 km of the proposed pipeline AOD.

3.4.3 Rivers and Streams

The pipeline corridor crosses the Serpentine River. Several agricultural drains are also required to be crossed during the construction of the proposed pipeline. Most agricultural drains will be crossed using open cut methods however Horizontal Direct Drilling (HDD) will be used to cross the Serpentine River.

3.5 Ecology

3.5.1 Bioregion and Vegetation Communities

The entire pipeline will be constructed on the Swan Coastal Plain which can be divided into 7 vegetation communities. Of the seven vegetation communities, two will be traversed during the construction of this pipeline.

- **Spearwood Dunes** – the northern portion of this region is characterised by *Eucalyptus gomphocephala* woodlands, heath on shallow soils or ridges and low *Banksia* woodlands on the slopes. The southern portion of this region is characterised by woody communities of *Melaleuca* and *Banksia*, samphires on the margins of the salt lakes, a eucalypt woodland (*Eucalyptus gomphocephala* and *E. marginata*) and minor communities of heath, low woodland (with *Melaleuca* and *Banksia*) and low forest.
- **Bassendean Dunes** – the dominant vegetation in this region is low *Banksia* woodlands dominated by *Banksia attenuate, B. menziesii, B. ilicifolia, Eucalyptus todtiana* and *Nuytsia floribunda* with a dense understorey of sclerophyll shrubs.

Mattiske (2003) identified 45 vegetation communities along the Kwinana to Australind Infrastructure Corridor including the Looping 10 project area. Of the species identified, 11 fall within the Looping 10 project area and are summarised in Table 3-5 below.

Table 3-5: Vegetation Communities of Looping 10 Project Area

Group	Total Communities
Eucalyptus rudis Woodlands	1
Corymbia calophylla Woodlands	2
Eucalyptus gomphocephala Woodlands	4
Eucalyptus decipiens Woodlands	1
Banksia Woodlands	1
Melaleuca Woodlands	1
Kunzea ericifolia subsp. *ericifolia* Shrublands	1

These communities are discussed in the Mattiske (2003) report provided in Appendix 3 including the vegetation community mapping completed by Mattiske that is relevant to the Project.

3.5.2 Vegetation and Flora

The existing easement was cleared for the installation of the original DBNGP. It is evident from aerial photography and ground-truthing that the easement has not fully regrown (other than the Lowlands Bushlands section where the regeneration has been strong). However, some clearing is required, primarily in the Leda Bush Forever site, Leda Nature Reserve and in Lowlands Bushland, Western Block. A restricted working width of 20m will be implemented in these environmentally sensitive areas (see Appendix 6). The estimated total area that is proposed to be cleared is approximately 22.2 ha.

Although a CALM database search found no Declared Rare Flora (DRF) or Priority Flora (PF) species on the proposed route, the search did identify the following DRF and PF Species in close proximity to the proposed route:

- *Caladenia huegelii* (DRF)
- *Drakaea elastica* (DRF)
- *Diuris micrantha* (DRF)
- *Acacia Lasiocarpa var bracteolata* long peduncle variant (P1)
- *Dillwynia dillwynioides* (P3)

- *Stylidium longitubum* (P3)

Woodman Consulting conducted spring surveys of the Leda Bushland, Leda Nature Reserve and of Lowlands Bushland, Western Block.

The DRF *Drakaea elastica* was identified in 7 (seven) locations within the DBNGP easement between KP 17 and KP 18 (Lowlands Bushland, Western Block).

Two mature flowering plants of *Calochilus* sp. were also located 4 m to the south-west of the existing pipeline in Lowlands Bushland, Western Block. This orchid is rarely seen however it is not a priority species.

The condition of the vegetation along the route varies. Vegetation within the Leda Nature Reserve is largely intact, however, disturbance is evident along areas where the original pipeline was laid. There is some damage due to off road vehicles, woodcutters and fire. Leda is located from KP 0.38 to KP 7.4. Large lengths of *Eucalyptus gomphocephala* Woodlands are intact where the pipeline route bends east, south of Leda Nature Reserve. Parts of the Leda area are in very good condition, others are in fair condition. The area contains a number of widespread weed species. Of the 248 taxa identified in Leda, 88 were introduced weed species.

South of Mundijong Road, the area is largely agricultural (cleared), however, patches of disturbed woodlands are evident.

Folly's Pool is located on privately owned land used primarily for rural activities. Native vegetation is located within the wetland, however the surrounding upland vegetation has been totally modified or cleared.

The proposed pipeline crosses the Serpentine River. Lowlands Bushland, Western Block (KP 16.9 to 18.2), located adjacent and south of Serpentine River and supports *Banksia* Woodlands and *Kunzea erificofolia* shrublands. The Banksia woodlands are in very good condition but there is weed invasion in the flooded gum woodlands and ephemeral wetlands on the western side of the block. A gas pipeline and powerline easements add to the disturbance on this block and there is evidence of dieback invasion along these service corridors. This area has survived long periods free of fire (BBG 2004).

The area from the south of Lowlands Bushland, Western Block to the proposed end point is largely cleared private properties.

3.5.3 Nature Reserves and Bush Forever

CALM estate or lands managed by CALM are vested in the Conservation Commission of Western Australia. The proposed pipeline route traverses one area of CALM estate, the Class A Reserve 33581, Leda Nature Reserve, vested for the Conservation of Flora and Fauna.

Bush Forever was created with the aim of protecting a target figure of at least 10 per cent of the 26 original vegetation complexes and to conserve Threatened Ecological Communities (TEC) within the Swan Coastal Plain portion of the Perth metropolitan area. Bush Forever sites are managed by the Department for Planning and Infrastructure. The following Bush Forever sites have been identified in the vicinity of the proposed pipeline.

Table 3-6: Bush Forever Sites

Site Number	Location Name	Vegetation Complex	Area Protected	Distance from corridor
349	Leda and adjacent bushland, Leda	Cottesloe Central & South Karrakatta Central and South	18% 8%	Crosses for 7km.
356	Lake Coolongup, Lake Walyungup and adjacent	Cottesloe Central & South	18%	Directly Adjacent for < 1km

	bushland, Hillman to Port Kennedy			
418	Folly Pool, Baldivis	Serpentine River	4%	Passes Near KP 13 for less than 0.05Km
372	Lowlands Bushland, Western Block, Peel Estate	Bassendean Central & South Dardanup Southern River	13% 11% 10%	Crosses for 1.4km

3.5.4 Fauna

A desktop study undertaken by Bamford & Davis (2003) identified that the habitat within the AOD may have the potential to support four species of fish, nine species of frogs, forty-five species of reptiles, twenty-six species of waterbirds, ninety-six land bird species and twenty-three species of mammals.

A search conducted using the DEH interactive search tool (DEH 2005) in conjunction the Bamford & Davis (2003) review identified that the following EPBC listed species that may be expected to be found in the project area:

- Fork Tailed Swift (*Apus pacificus*)
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)

Other significant fauna likely to be present along the proposed route include:

- South West Carpet Python (*Morelia spilota imbricata*)
- Peregrine Falcon (*Falco peregrinus*)
- Barking Owl (*Ninox connivens*)
- Rakali or Water Rat (*Hydromys chrysogaster*)
- Brush or Black-gloved Wallaby (*Macropus irma*)
- Southern Brown Bandicoot (*Isoodon obesulus*)

There is also the potential for four Priority 1 and two Priority 4 species to be in the vicinity of the pipeline AOD (Bamford & Davis, 2003). These include:

- *Calyptorhynchus baudinii* Baudin's Black-Cockatoo (Priority 1)
- *Calyptorhynchus Latirostris* Carnaby's Black – Cockatoo (Priority 1)
- *Phascogale calura* Red-tailed Phascogale (Priority 1)
- *Setonix branchyurus* Quokka (Priority 1)
- *Morelia spilota imbricata* South-West Carpet Python (Priority 4)
- *Falco peregrinus* Peregrine Falcon (Priority 4)

All of the identified fauna species would be transitory through the area and it is highly unlikely that the area represents critical habitat for any of these species. A comparison to the EPBC Act Administrative Guidelines on Significance indicates that installation and operation of the proposed pipeline would not represent a significant impact on listed species for the following reasons:

- it is not likely to lead to a long-term decrease in the size of a population of a listed or migratory species
- it will not cause a significant reduction the area of occupancy of a listed or migratory species
- it will not cause fragmentation of an existing population of a listed species
- it will not cause a substantial modification or isolation of an important habitat for migratory species
- it will not adversely affect habitat critical to the survival of a listed or migratory species
- it will not cause disruption to the breeding cycle of a population of a listed or migratory species
- it will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that a listed species or migratory is likely to decline

- it is not likely to result in the introduction of invasive species harmful to a listed or migratory species
- it is not likely to cause interference with the recovery of a listed species.

3.6 Heritage

An ethnographic survey to identify sites of cultural heritage significance and to conduct an archaeological inspection to identify any archaeological sites in the project area has been undertaken.

A search of the DIA database identified six Aboriginal sites previously recorded in the vicinity of the Project AOD. A number of the previously recorded sites are in close proximity, including two camps of historical significance, to the planned Project. These sites are unlikely to be disturbed by the proposed works. Of the four registered sites likely to be impacted by the corridor of the Project, three sites are artefact scatters or archaeological, and one is mythological or ethnographic.

Two artefact scatters are no longer sites because they were completely collected at the time of recording in February 1974. A third artefact scatter may have been destroyed by subsequent development according to the DIA site file. An archaeological inspection undertaken by AIC in August 2005 failed to locate the third artefact scatter and it is assumed that it may have been destroyed by subsequent development.

No new sites or areas of cultural heritage significance were identified during the ethnographic investigations (AIC 2005).

The proposed pipeline corridor also crosses one European heritage site, the Leda Bushland Reserve. Five European Heritage sites have also been identified within 500 m of the corridor.

3.7 Social and Economic

The pipeline commences within the Town of Kwinana, passes through the City of Rockingham (between KP 7.5 and KP 16.8) and terminates in the Shire of Serpentine Jarrahdale.

Kwinana is located 40km south of Perth, covers an area of 118 km² and has a population of approximately 21,000 people living in 5 suburbs plus the surrounding rural areas. The surrounding rural localities include Naval Base, Hope Valley, The Spectacles, Anketell, Mandogalup, Postans, Wandi, Casuarina, Wellard and Kwinana Beach. The Kwinana industrial area is one of the main industrial sites in WA and contributes to approximately 10%, or $8 billion, of the state's economic output.

The City of Rockingham is located 47 kilometres south/west of Perth, covers an area of 261km² and has a population of approximately 79,000. Industry in the region includes a Nickel refinery, light industry, fishing, farming, tourism, forestry, horticulture and viticulture.

The Serpentine / Jarrahdale Shire is located 45kms south east of Perth and is comprised of an agricultural and rural lifestyle district. The Shire is 905km², has a population of 11,120 and includes the townsites and localities of Byford, Serpentine, Jarrahdale, Oakford, Oldbury, Mundijong, Mardella, Karrakup, Whitby, Keysbrook, Cardup, Hopeland and Darling Downs. Industry in the region include equine, horticulture, agriculture, timber production, brickworks, viticulture and tourism. The Shire is also in close proximity to the freight ports of Fremantle, Kwinana and Bunbury, as well as Perth.

The DBNGP corridor is located primarily on rural land or public reserves or open spaces and is not in close proximity (ie less than 500m) to any of the townships it passes by.

The looping of the DBNGP will not have any immediate long-term direct impact on the economy of the region, however the expansion of the DBNGP will meet the increasing

demand for energy in the South West for electricity generation, industrial expansion and increasing domestic gas consumption. This may lead to further long-term investment in the region.

4 Risk Assessment

DBP is committed to continual improvement in performance, efficient use of natural resources and aspire to zero harm to the environment. A risk-based approach is applied in the management of construction and operations; the overall philosophy is to give priority to designing the pipeline and work activities in such a manner as to avoid the creation of hazards that may lead to the potential for environmental impact. Where this is not possible, the priority will be to minimise and mitigate potential environmental impact through design and/or the implementation of specific constructional processes and procedures. Where environmental hazards are inevitable, they are to be managed to ensure that the potential for environmental harm is reduced to As Low As Reasonably Practicable (ALARP). The environmental risk assessment workshop for this project was conducted July 2005 using methodology based on AS/NZ 4360:1999. The results of this workshop will be included in the CEMP as per the DoIR guidelines.

At the risk workshop, each potential environmental impact was assessed to determine its consequence (Table 4-1) and likelihood (Table 4-2). The risk matrix (Table 4-3) combines the consequence and likelihood to determine the risk ranking which in turn assigned the correct level of management required (Table 4-4) to successfully reduce the environmental risk to ALARP.

Table 4-1: Consequence

	Corporate	Loss	Environmental	Outrage
5 Catastrophic	Would threaten the survival of Alinta or one or more of its Business Units	> 20 m	Extinction to flora/ fauna species and irreparable damage to soil/water Impairment of ecosystem function. Long term effects to significant environment	Total outrage (eg. Longford, Auckland (attributable to Alinta))
4 Major	Would threaten the effective operation of Alinta for a period of up to a year or have a significant effect on how Alinta will operate in the future	10m-20m	Serious environmental effects with some impairment of ecosystem function eg. displacement of a species. Impairment of species of national significance	Major Alarm and anger – Impact supply to > 10% of customers for a day (electricity), several days (gas)
3 Severe	No threat to the effective operation of Alinta, but exposes Alinta to unacceptable cost consequences	2m-10m	Moderate damage to flora/ fauna and soil/ water. Impairment of species of regional significance	Widespread complaints and anger
2 Serious	No material impact on Alinta, issues are dealt with internally	200k-2m	Limited damage to flora/ fauna and soil/water Impairment of species of local significance	Limited complaints and anger
1 Minor	No material impact on Alinta, issues are routinely dealt with by operational areas	<200k	No damage to flora/ fauna and short term effects on soil/water and air. Local loss of species – flora and fauna well represented	Annoyance, concern and some complaints

Table 4-2: Likelihood

5 – Almost Certain	Event is expected to occur in most circumstances
4 – Likely	Event will probably occur in most circumstances
3 – Possible	Event should occur some time
2 – Unlikely	Event could occur at some time
1 - Rare	Event may occur only in exceptional circumstances

Table 4-3: Risk Matrix

Likelihood\Consequence	**1 Minor**	**2 Serious**	**3 Severe**	**4 Major**	**5 Catastrophic**
5 Almost Certain	Moderate	High	Extreme	Extreme	Extreme
4 Likely	Moderate	Significant	High	Extreme	Extreme
3 Possible	Moderate	Moderate	Significant	High	Extreme
2 Unlikely	Low	Low	Moderate	Significant	High
1 Rare	Low	Low	Moderate	Moderate	Significant

Table 4-4: Management Levels

Legend	
Extreme	Detailed research and management planning required at senior levels
High	Immediate senior management attention needed
Significant	Senior management attention needed
Moderate	Management responsibility must be specified
Low	Manage by routine procedures

Parties present at the environmental risk assessment workshop were:

- Department of Conservation and Land Management
- Department of Environment
- Environmental Protection Authority Services Unit
- Department of Planning and Infrastructure
- Office of Energy
- Land Access Australia
- Alinta Network Services
- Worley Parsons
- Ecos Consulting (Aust) Pty Ltd
- Woodman Environmental Consulting (vegetation specialists)
- Bamford Consulting (fauna specialists) and
- KT Pipelines Pty Ltd

Specifically, the following areas were examined during the risk assessment:

- Soil Compaction
- Soil Contamination
- Bushfire control
- Environmental Hygiene (Weed and Dieback control)
- Fauna
- Spill management and contingency
- Waste
- Erosion, Topsoil and Dust
- Rehabilitation
- Wetlands
- Watercourses
- Flora and vegetation
- Access and
- Noise, Blasting and Vibration

The majority of potential impacts are considered to be of low risk and can be managed through standard operating procedures. Three aspects were considered be of moderate or significant risk and these will require senior management attention. These aspects related to:

- Acid Sulphate Soils
- Flora disturbance and rehabilitation
- Environmental hygiene (weeds and dieback)

The environmental impacts and management are discussed in more detail in Section 5.

5 Environmental Impacts and Management

5.1 Overview

Most aspects of pipeline construction can be managed by standard operational procedures, as detailed in the Australian Pipeline Industry Association (APIA) *Code of Environmental Practice*. However based on the risk assessment and in conjunction with feedback during the stakeholder consultation process, a number of aspects do require a higher level of management attention. These issues include the following aspects:

- Acid Sulphate Soils
- Flora Disturbance and Rehabilitation;
- Environmental hygiene (weeds and dieback)

This section aims to provide a brief description of the potential environmental impacts and the proposed management measures for these issues. The entire list of environmental management commitments will be detailed in the Construction Environmental Management Plan (CEMP) that will be submitted to the DoIR as required under the *Petroleum Pipelines Act 1969*. This CEMP will also address any Ministerial Conditions that will results as part of the ARI process.

This section aims to provide a brief description of the potential environmental impacts and the proposed management measures for these issues.

5.2 Potential Impacts and Mitigation Measures

5.2.1 Soils and Terrain

The following activities have the potential to affect the soils and terrain of the Project AOD:

- clear-and-grade operations
- trenching
- backfilling
- reinstatement
- refuelling
- construction access.

Potential localised impacts to the soils and terrain of the Project AOD include:

- erosion and sedimentation
- soil inversion
- soil compaction
- soil contamination
- acid sulphate soil formation.

In addition, the soils and terrain of the Project AOD present potential constraints to pipeline construction and operation activities. These will be addressed in alignment selection, pipeline design and construction. In particular, they include:

- trench collapse during construction in sandy soils or wet soils
- subsidence of the trench.

These constraints are discussed further under ‘Erosion and Sedimentation’ below and in Section 5.2.1.1.

<u>Erosion and Sedimentation</u>

Erosion and sedimentation are key potential environmental impacts associated with pipeline construction projects. Pipeline construction primarily consists of earth moving activities, which remove surface cover and disturb soil profiles. Therefore, there is potential for sedimentation of the adjacent environments if adequate controls are not implemented.

During rainfall events (particularly over winter) the pipeline alignment may be subject to erosion by water and subsequent transportation and deposition of this sediment off the alignment (sedimentation). However, appropriate drainage controls, topsoil/spoil stockpile management and maintenance of erosion control devices will protect soils and surface water environments from significant erosion and sedimentation impacts.

Inadequate soil compaction over the trench line may also lead to trench subsidence and subsequent erosion. During the summer months when rainfall is low, erosion (or aeolian scour) may result from wind action on soils where prolonged exposure occurs following initial clearing.

Soil Inversion

Without effective soil management, topsoil may be "lost" during the construction process by burial beneath (or mixing with) trench spoil during stockpiling, covering with sediment washed in from adjacent areas or returning trench spoil and topsoil to the trench in a sequence different to original profiles.

The loss of topsoil reduces the effectiveness of easement restoration and agricultural based land use activities by limiting the amount of available nutrients, biomass and productivity. However, topsoil is not expected to be "lost" due to the topsoil separation and management measures that will be implemented.

Soil Compaction

Pipeline construction requires compaction of the backfilled trench to prevent the disturbed soil from subsiding. However, vehicle traffic elsewhere on the construction easement can lead to soil compaction, in particular equipment and machinery laydown areas or areas of heavy vehicle traffic. Soil compaction may change local drainage patterns and prevent effective plant growth. Activities that may cause soil compaction will be restricted to approved areas (e.g. the right of way and access tracks) and will be temporary, as it will be rectified during rehabilitation by ripping or scarifying.

Soil Contamination

The potential also exists for construction related activities to result in localised soil contamination. The main potential sources of contamination are:

- minor spills of fuel or chemicals
- leachate from acid sulphate soils created by exposure to oxygen (oxidation) of soils during trenching
- discharged hydrotest water.

Pipeline projects involve relatively small quantities of chemicals and likely volumes of spills are extremely low. Pipeline construction equipment (such as graders, bulldozers and side-boom tractors) will be refuelled on the AOD from a standard fuel truck. Light vehicles will be refuelled off the AOD. Environmental controls and quality systems will be implemented as discussed below, including erosion and sediment controls and spill prevention and cleanup measures.

Acid Sulphate Soil

Acid sulphate soils form where exposure of sulphate rich soils to oxygen results in the production of acid (sulphuric acid), which can mobilise heavy metals in the soil. The creation of acid sulphate soils can affect soil quality, water quality and land use. These sulphate rich soils may be present on the pipeline alignment.

5.2.1.1 Impact Mitigation

Mitigation measures outlined in the APIA *Code of Environmental Practice* will be implemented via the Construction Environmental Management Plan to minimise potential impacts.

To minimise potential impacts to soil and terrain, ANS will:

Erosion and sedimentation

- where appropriate conduct geotechnical surveys to identify areas of potential subsidence or collapse and include the findings of these studies into pipeline design specifications and construction management plans
- limit ground disturbance and vegetation clearing to the minimum extent necessary for safe pipeline construction
- during periods of heavy rainfall, suspend all activities likely to result in erosion and sedimentation if their effects cannot be adequately controlled and they may result in pollution of the environment
- install and maintain erosion and sediment control structures in accordance with the construction environmental management plan (e.g. diversion berms and cross ditches to divert water off the AOD to adjacent stable ground)
- limit the period between clear-and-grade and restoration to the minimum practicable
- install trench breakers to reduce in trench water movement and potential subsidence and related erosion
- compact the trench to a level consistent with surrounding soils
- implement appropriate physical and biological stabilisation and site rehabilitation measures in accordance with the construction environmental management plan
- leave periodic breaks in any crown to prevent channelling of run-off along the AOD
- after construction is completed:
  - routinely inspect and maintain erosion and sediment control structures, particularly after heavy or prolonged rainfall
  - regularly inspect the AOD during operations to identify areas of subsidence
- implement appropriate measures to permanently solve any recurring erosion or subsidence problems.

Soil inversion

- clearly identify the importance of stockpiling topsoil and trench spoil separately in the CEMP and environmental inductions
- stockpile topsoil and trench spoil separately
- at the completion of works, respread topsoil across the easement
- regularly inspect the easement to monitor rehabilitation.

Soil compaction

- identify access tracks and turn-around points for vehicles prior to construction
- minimise the number of planned tracks and use existing tracks as far as practicable
- restrict all vehicles and equipment movements to the AOD or designated access tracks and roads
- rip or scarify compacted areas where necessary to facilitate vegetation growth
- regularly inspect the AOD to monitor rehabilitation.

Soil contamination

- include a spill prevention, response and cleanup procedure in the CEMP including refuelling techniques and chemical storage and handling requirements
- ensure the AOD is kept free of consumable rubbish (such as lunch wrappers) and construction generated waste
- regularly inspect machinery for fuel and oil leaks and maintain in good working order
- use drip tray and spill mats for each coupling during refuelling truck operations
- use spill mats and spill containment equipment onsite where diesel pumps are required on the AOD
- implement cleanup procedures if a spill occurs
- incorporate procedures for trench dewatering, hydrotest water disposal and management of contaminated water (for example highly saline groundwater, leachate from acid sulphate soils) into the CEMP. these may include measures to:

  - dispose of water on site after assessment/analysis, provided the water meets doe criteria for the disposal site
  - contain and treat water on site
  - remove water off site
- obtain landholder approval and EPA approval if required for disposal of trench water outside the AOD or disposal of saline trench water
- after construction is completed:
  - inspect easement to ensure any construction generated rubbish / equipment is removed
  - inspect the easement to ensure that any spills which may have occurred are appropriately remediated.

Acid sulphate soil (ASS) formation

- conduct a targeted assessment of the final alignment to determine if any areas of potential acid sulphate soils are present and include these locations on the construction drawings and the environmental line list
- if acid sulphate soils are present, incorporate acid sulphate soil management procedures into the ASS Management Plan. these may include measures to:
  - minimise the time that trench spoil is stockpiled
  - neutralise trench spoil with lime both after excavation and during backfill
  - contain runoff from stockpile areas in holding ponds or bunded areas
  - dispose of trench water only after analysis
- inspect the AOD to monitor rehabilitation in any acid sulphate soil regions.

Areas identified from the ASS investigation that contains ASS or PASS will have monitoring bores (piezometers) installed on the up and down gradient side of the water table on the edges of the AOD. Ground water will be monitored during and after construction to assess whether acidic conditions have been generated. Additional detailed mitigation measures for ASS will be included in the CEMP.

5.2.2 Water Resources

5.2.2.1 Potential Impacts

The following activities have the potential to affect the shallow groundwater and surface water resources within the Project area:

- topsoil stripping
- construction of the pipeline trench
- de-watering of the trench to aid construction
- the storage and handling of small quantities of fuel and chemicals (which have the potential to be spilt)
- the presence of the back-filled trench during operation
- hydrostatic testing
- watercourse crossings.

Potential impacts of pipeline construction on groundwater and surface water resources include:

- alteration to groundwater and surface water flow regimes
- increased sediment load and turbidity
- contamination
- disruption to third party use
- disturbance to groundwater infrastructure.

The presence of shallow groundwater may also constrain standard construction activities.

Due to the nature of pipeline construction activities and operational conditions (particularly the shallow depth of trenching and the low risk of any surface contamination), no impacts to deep aquifers are likely to occur and these are not considered further.

No impacts to surface water or groundwater are expected after construction during operation, following the successful restoration of surface contours and stability.

Alteration to shallow groundwater and surface water flow regimes

The intersection of shallow groundwater (including wetlands) by the open trench has the potential to create localised disturbance to flow patterns, particularly in recharge or discharge zones. However, as the pipeline will be constructed in an almost exclusively unconfined sand aquifer, groundwater has the potential to flow both over and under the pipeline once it is installed.

The potential for minor localised disruptions to groundwater flow is noted however due to the minor depth of the intrusion (approximately 1.5 m) and the short period for which the trench is open (approximately one to three weeks, depending on the location), the resultant impact on groundwater flows is considered to be inconsequential. The sandy soils in which construction will occur will result in an almost immediate drawdown affect on shallow groundwater in the localised area. However, once backfill has been completed, due to the high permeability of the sandy soils, the groundwater table should recover back to its previous level within days (Parsons Brinckerhoff pers comm 2005; GHD pers comm 2005).

To aid construction, it is common pipeline industry practice to pump accumulated water from the trench to infiltration locations where the groundwater table is replenished with the water removed from the trench. Impacts are local and short term and not anticipated to have any measurable effect on groundwater resources.

Backfilling the trench after the pipeline has been laid aims to adequately compact returned trench spoil consistent with pre-existing conditions. If the backfilled trench is significantly less compacted than the surrounding soils, it may act as a horizontal conduit to water, altering the local hydrology. Alternatively, if sections of the trench are compacted more than pre-existing conditions, lateral flows of groundwater may be impeded, potentially resulting in accumulation of groundwater up gradient of compacted surfaces. However, this is unlikely to cause significant impacts due to the relatively shallow trenching depths and soil structures in the project area (Parsons Brinckerhoff pers comm 2005).

Construction activities may result in physical disturbance to defined watercourses and to overland flow. Impacts to surface drainage patterns associated with overland flow away from watercourses are less noticeable. If they occur, impacts are most likely to be associated with the presence of temporary linear stockpiles of topsoil and trench spoil and modifications to surface contours during earthworks, which may impede or change natural overland flows.

Increased sediment load and turbidity

A temporary reduction in water quality caused by sediments entering streams and increasing turbidity is the most likely potential impact to occur during construction. The major source of sediment is erosion, transported by surface run-off, stream bank collapse and disposal of turbid trench water. The extent of sedimentation is determined by factors such as soil type, slope, run-off volume and velocity and vegetation cover. The timing of construction in predominantly dry conditions and the implementation of appropriate drainage controls, topsoil/spoil stockpile management and maintenance of erosion control devices will protect surface water environments from significant erosion and sedimentation impacts.

Contamination of surface water or groundwater

The potential exists for Project related activities to result in localised groundwater or surface water contamination. The main potential sources of contamination are:

- minor spills of fuel or chemicals
- saline groundwater pumped out of the trench during construction
- leachate from acid sulphate soils created by exposure (and oxidation) of soils during trenching
- discharged hydrotest water.

Pipeline projects involve relatively small quantities of chemicals and the risks to water resources associated with minor spills are extremely low. Pipeline construction equipment (such as graders, bulldozers and side-boom tractors) will be refuelled on the AOD from a standard fuel truck. These trucks hold up to 16 000 litres, however it is highly unlikely that a storage tank on a fuel truck would be breached and the entire contents be spilt.

As discussed in Section 5.1, the pipeline corridor also traverses some areas with potential for occurrence of acid sulphate soils. Adequate planning and management is required to prevent or mitigate localised impacts to surface water.

Disturbance to Wetlands

During trenching and installation of the proposed pipeline dewatering measures may be required to provide a dry environment. This will result in the aquifers surrounding the excavated trench to be drawn down (GHD, 2005). The radius of influence will depend on a number of factors including water table depth and length of open trench. The quality of groundwater discharges will also need to be compatible with water quality guidelines, and with any receptor waters.

Watercourse crossings

Either open cut or closed techniques can be used to cross watercourses. A summary of different watercourse crossing techniques to compare potential impacts is presented in Table 5-1.

The major water course in the project area is the Serpentine River and it will be crossed using the HDD technique. The scheduling of construction for dry conditions and the proposed mitigation measures will ensure that impacts to watercourses are not significant or long-term.

Table 5-1: Potential Impacts of Different Watercourse Crossing Techniques

Technique	Potential Hazard	Potential Impact
Open Cut	Inadequate sedimentation controls	Potentially high sediment release during backfilling if controls are not adequately in place
Horizontal Directional Drill	Loss of circulation, collapsed hole, stuck drill stem, lost tools	Failure leads to subsequent attempts and possible additional land requirements
	Drill mud seepage directly into land and water course	Prolonged sediment load and deposition
	Washout of cavities and collapse of AOD	Sink holes on AOD and under water course
	Deviation of drill alignment	Potential third party damage
	General	Large footprint required for drill pad Short-term visual impacts due to presence of equipment Noise impacts due to stationary workforce and continuous operation
Boring	Collapsed hole, stuck drill stem, lost tools	Failure leads to subsequent attempts and possible additional land requirements
	Washout of cavities and collapse of AOD	Sink holes on right of way and under water course
	Bellhole Dewatering	Discharge erosion, contamination
	General	Short term visual impacts due to presence of equipment Noise impacts due to stationary workforce and continuous operation

(*Adapted from Canadian Pipeline Water Crossing Committee, 1999)*

5.2.2.2 Impact Mitigation

Impacts to water resources are expected to be minor and temporary. Construction will be carried out during dry conditions (i.e. summer). The risk of erosion is relatively low due to the topography and nature of the watercourses. Sediment and erosion control measures outlined in the APIA *Code of Environmental Practice* will be implemented via the Construction Environmental Management Plan (CEMP) to minimise potential impacts.

The water table in the low lying areas was identified at around 0.5 mBGL during the ASS infield investigation in late October 2005. The risk of intersecting and disrupting shallow groundwater tables is also significantly reduced due to the summer construction period where ground water levels will have dropped significantly (PB pers comms 2005).

Areas identified as having shallow water tables during the ASS infield investigation (Oct 2005) will have monitoring bores (piezometers) installed both up and down gradient of the water table at the edges of the AOD. This will enable regular the monitoring of groundwater levels to gauge the actual impact and rate of recovery of the water table due to dewatering.

The CEMP will include site specific requirements where appropriate.

ANS will implement the following specific measures to mitigate potential impacts to water resources:

- avoid large trees which provide habitats and assist bank stability
- compact the trench to a level approximately consistent with surrounding soils
- install trench breakers to prevent longitudinal water flow within the trench on slopes approaching watercourses
- include the locations of features such as groundwater discharge, and acid sulphate soils on construction drawings
- reinstate surface contours as soon as reasonably practicable
- at watercourse crossings:
  - conduct subsequent grading and trenching immediately prior to pipe laying (that is, after the pipe is welded)
  - stockpile material in bunded areas away from the watercourse banks
  - contain pumps within lined, bunded areas
  - complete watercourse crossings within the shortest period practicable to minimise the period of open trench and subsequent environmental disturbance
  - avoid watercourse crossing works during periods of flood or heavy rainfall
  - ensure all equipment necessary for the stream crossing is on-site and in good working order prior to commencing work
  - obtain approvals for watercourse crossings from the Department of Environment
- where HDD is used for watercourse crossings
  - locate HDD drill entry and exit points away from watercourse banks, sensitive vegetation and any heritage sites
  - monitor drill entry and exit points for potential fracturing out of drilling mud
  - dispose of drilling mud (bentonite) and cuttings as per approval requirements
  - ensure HDD equipment is in good working order
  - reinstate HDD entry and exit sites (revegetation of the easement aims to re-establish local indigenous plant species where possible) in consultation with regulatory authorities
- remain vigilant for expected storm or flood warnings and develop a contingency plan for such events
- during periods of heavy rainfall, suspend all activities likely to result in erosion and sedimentation if their effects cannot be adequately controlled and they may result in pollution of the environment
- ensure adequate erosion and sediment controls are in place to protect water resources:
  - design erosion and sediment control measures that consider site conditions, slope, vegetation cover, proximity to sensitive environments, construction phase and climatic conditions
  - install diversion berms or drains along the top and at intermediate points down the slopes to the watercourse
  - install silt fences as necessary for interim on-site erosion control

    - monitor, maintain and repair erosion and sedimentation controls to ensure they remain effective, particularly after heavy rainfall events and during periods of prolonged rainfall
- handle and store chemicals in accordance with Material Safety Data Sheet requirements
- store fuels, lubricants and chemicals within containment areas (e.g. lined, bunded areas) in accordance with Australian Standard AS1940
- include a spill prevention, response and cleanup procedure into the Construction Environmental Management Plan (which will include refuelling techniques and chemical storage and handling requirements)
- ensure spill response and clean up equipment is on-site prior to commencing works
- prohibit vehicle refuelling within 50m of a watercourse or on a slope leading to a watercourse
- regularly inspect machinery for fuel and oil leaks and maintain in good working order
- obtain hydrotest water from an appropriate source in consultation with relevant landowners and regulatory bodies, in accordance with statutory requirements
- incorporate procedures for trench dewatering, hydrotest water disposal and management of contaminated water (for example highly saline groundwater, leachate from acid sulphate soils) into the Construction Environmental Management Plan. These may include measures to:
    - dispose of water on site after assessment/analysis, provided the water meets DoE criteria for the disposal site
    - contain and treat water on site
    - remove water off site.

Wetlands Hydrogeology Management

Looping 10 construction is timed for the summer months whereby the water table will be at its lower limits and the seasonally inundated wetlands would be expected to be dry. Specific mitigation measures that ANS will apply to wetlands will include:

- Open water bodies within a 50m radius and valuable wetlands (i.e. Conservation Category and EPP wetlands) will have monitoring bores (piezometers) installed both up and down gradient of the water table at the edges of the AOD. This will enable regular the monitoring of groundwater levels during the dewatering operations.

Should dewatering affect the water table then one of these four mitigation measures will be applied depending on site conditions (GHD, 2005):

    - reduce the length of the open trench such that lower dewatering rates can be applied
    - infiltration of abstracted trench dewatering water in proximity to the open water body
    - controlled dewatering inflow directly into the open water body depending on water compatibility and approval by DoE
    - stop work if severe impact on water body is likely to occur and develop other mitigation measures in consultation with the DoE.

- Abstracted groundwater will be monitored prior to the discharge of abstracted groundwater to ensure compatibility of dewatering water and receptor water particularly if ASS soils are encountered.

5.2.3 Vegetation

5.2.3.1 Potential Impacts

Approximately half of the pipeline AOD traverses mostly previously cleared native vegetation that has regenerated since the original pipeline was installed. The other half traverses cleared agricultural lands. Clearing of native vegetation, including re-growth, will be required.

Potential impacts of pipeline construction on vegetation include:

- clearing of vegetation
- alteration to groundwater and surface water flow regimes
- introduction or spread of weeds and diseases (eg. Dieback)
- smothering (dust).

5.2.3.2 Impact Mitigation

There was one species of DRF (*Drakaea elastics)* identified in 7 locations between KP 17 and KP 18 (Lowlands Bushland, Western Block) during the spring surveys.

Five individuals of *D. elastica* in four locations are situated in positions on the AOD such that removal is unavoidable. A 'Permit to Take' will be requested from CALM after the completion of the environmental approvals process but prior to construction. This will include site specific mitigation measures developed in consultation with CALM. The other *D. elastica* individuals on the AOD have been fully demarcated with a 5 m buffer in all directions with fence droppers and pink survey tape. These individuals will be avoided during construction.

A number of management measures will be identified for CEMP approval (DoIR) and undertaken prior to the commencement of construction activities (i.e clear and grade), including:

- development of a set of drawing depicting the total AOD. These drawings will include the construction spread, truck turnaround bays, lay down areas, and access routes
- development of construction drawings depicting the AOD in cross-section and identifying sections of the AOD where width reductions will occur
- on-ground inspection of the AOD by project environmental staff to identify areas requiring management (including flagging of vegetation)
- inclusion of site specific management measures on the Environmental Line List.

Management measures to minimise the impact of construction on the remaining vegetation include:

- flagging vegetation to be retained including large fauna habitat trees
- trimming of overhanging branches instead of whole tree removal
- stockpiling of all vegetation for use during rehabilitation
- following the hygiene management protocol to ensure no weeds or disease are spread along the corridor due to construction activities
- implementing dust control activities as required
- reinstating surface contours as soon as reasonably practicable
- including the locations of features such as groundwater discharge, and acid sulphate soils on alignment sheets
- ensuring no impacts occur to vegetation off the construction area.

A comprehensive rehabilitation plan has been developed to ensure that all disturbed land will regenerate to the vegetation that existed prior to the disturbance. The plan was developed on advice from the relevant specialist advisors and in consultation with CALM personnel as well as relevant stakeholders, including landholders, and will also address monitoring and management requirements. The plan has been submitted to the relevant authorities for their approval. This is discussed in more detail in Section 7.

The Rehabilitation Management Plan was based on the review of existing vegetation and the recovery of the vegetation that was cleared some 20 years ago. It has clear objectives and performance criteria. The Rehabilitation Management Plan is provided in Appendix 3.

5.2.4 Weeds and Dieback

5.2.4.1 Potential Impacts

Construction activities have the potential to introduce or disperse weeds and to introduce dieback to uninfected areas.

5.2.4.2 Impact Mitigation

A dieback and vegetation survey including weeds will be conducted prior to any construction activity occurring. This will provide input into the development of the Hygiene Management Protocol to be included in the CEMP, and will describe the steps that will be taken to minimise the risk of spreading dieback or weeds into dieback/weed free areas along the easement. These include:

- cleandown prior to vehicles entering the corridor
- cleandown locations at the end of each weed/dieback infected area, to be utilised during the clear and grade operation
- ensuring stockpiles of weed and weed-free material are kept separate and only respread back to their point of origin.

The protocol will be developed on advice from the relevant specialist advisors and in consultation with CALM personnel as well as relevant stakeholders, including landholders, and will also address monitoring and management requirements. The protocol will be submitted to the relevant authorities for their approval.

The Hygiene Management Protocol will also include information, if required, on any weed species requiring eradication prior to the commencement of construction.

As part of the Rehabilitation Management Plan, the easement will be inspected for weed outbreaks approximately 4 weeks after the first significant rainfall event (>5mm). Active control of weed outbreaks into previously uninfected areas along the easement will be carried out if required.

Other environmental management methods include:

- Environmental Line List (ELL)
- Environmental Inductions and Training
- Inspections and monitoring.

All management practices that are contained in the CEMP will be audited against the specified criteria.

5.2.5 Fauna

5.2.5.1 Potential Impacts

The following activities have the potential to affect fauna that may be located in the project area:

- creation of construction access
- clear-and-grade operations (creation of the AOD)
- trenching
- welding
- earthworks associated with creation of associated stockpiles, laydown or work areas and construction depots (if required).

Potential impacts of pipeline construction on fauna include:

- clearing of habitat
- decrease in habitat health due to the generation of dust
- disturbance due to noise emissions
- provision of temporary artificial watering sites

- potential mortality from exposure due to entrapment in the trench.

The risk of fauna mortality due to machinery operation, collision with vehicles or entrapment in the trench is considered low due to the nature of the planned operations. However, it is possible that some species of small mammals, reptiles and amphibians may fall into the trench and perish.

5.2.5.2 Impact Mitigation

A fauna management protocol will be included in the CEMP. This will be aimed at avoiding fauna injury or mortality.

The protocol will be developed on advice from the relevant specialist advisors and in consultation with CALM personnel as well as relevant stakeholders. The plan will be submitted to the relevant authorities for their approval.

To mitigate potential impacts, ANS will:

- retain habitat trees where feasible. where trees can not be retained, a fauna handler will inspect fallen trees for fauna requiring assistance
- the trench will be constructed with trench plugs at <1km spacing. trench plugs will be ramped out at a ratio of not less than 45 degrees to facilitate fauna escape
- the trench will be inspected daily and cleared of all fauna by the fauna handling team by no later than 10 am each day
- shelters (e.g. hessian bags, cardboard boxes) will be installed in trenches at approximately 100m intervals
- there will typically be 7km of trench open at any time (excluding rock breaking activities)
- sections of trench will be left open for as short a period as practicable. this will generally be less than two weeks. areas requiring a shorter period will be identified in the fauna management protocol and incorporated into the environmental line list.
- water in the trench will be pumped out on a daily basis
- the feeding of animals, hunting, fire arms and pets on the construction site will be prohibited
- injured fauna will be transferred to listed wildlife carers where practicable
- details of fauna encountered in the trench or other activities will be recorded and identified
- noise and dust emissions will be mitigated as described in sections 5.2.7 (noise) and 5.2.8 (air emissions).

5.2.6 Heritage

5.2.6.1 Potential Impacts

The proposed earthworks (particularly clear-and-grade operations) associated with pipeline construction have the potential to disturb archaeological material, should it be present. Impacts may include:

- damage to shallow artefact scatters
- damage to subsurface material
- damage to significant vegetation (for example scarred trees).

5.2.6.2 Impact Mitigation

ANS will implement the following measures to mitigate potential impacts to indigenous cultural heritage:

- install flagging, protective fencing or erosion control measures to protect any sites detected near the easement which will not be directly affected by construction

- in the unlikely case that sites are detected on the alignment and cannot be avoided, obtain appropriate authorisation for unavoidable site disturbances necessary to permit the construction of the pipeline
- undertake on-site monitoring of clear and grade operations
- include Indigenous site identification and protection as part of the induction course
- in the event that site earthworks uncover potential Indigenous heritage material:
  - halt work at this location and establish a 100m buffer around the site. Work may continue outside the buffer area
  - site monitors and archaeologist should take immediate steps to evaluate the material. If monitors/ archaeologist are not present, work should stop immediately and contact made with the relevant heritage group
  - suspend works at the discovery site so that an evaluation of the nature of the discovery can be undertaken, along with an appropriate course of action.
  - the course of action may consist of recording the site location, removal of the cultural material or site protection as appropriate under the relevant legislation.

5.2.7 Noise Emissions

5.2.7.1 Potential Impacts

Pipeline construction activity will result in a temporary increase in noise levels within the immediate vicinity of the alignment, associated with the operation of vehicles and equipment such as excavators, graders, bulldozers and boring equipment. However, this impact is expected to be of short duration and intensity. It is not anticipated there will be any requirement for blasting to be carried out.

Public

Noise control measures are covered in Part 2, Regulation 7 of the *Environmental Protection (Noise) Regulations* 1997. These regulations outline the prescribed standards for noise emissions, and to exceed these standards is an offence. However, Part 2 Regulation 13 of the Environmental Protection (Noise) Regulations 1997 states:

> *13. Construction Sites*
>
> *"construction site" means premises or a public place on which the sole or principal activity is the carrying out of construction work*
>
> "construction work" means-
>
> *13.1(d) work in laying any pipe or work in lining pipe that is done at or adjacent to the place where the pip is laid or to be laid;*
>
> Part 2, Regulation 13.2 states;
>
> *Regulation 7 does not apply to noise emitted from a construction site as a result of construction work carried out between 0700 hours and 1900 hours on any day which is not a Sunday or a public holiday if the occupier of the premises or public place, shows that –*
>
> *(a) the construction work was carried out in accordance with control of environmental noise practices set out in section 6 of AS 2436-1981 Guide to Noise Control on Construction , Maintenance and Demolition Sites;*
>
> *(b) the equipment used on the premises was the quietest reasonably available; and*
>
> *(c) if the occupier was required to prepare a noise management plan under sub regulation (4) in respect of the construction site-*

(i) the noise management plan was prepared and given in accordance with the requirement, and approved by the Chief Executive Officer; and

(ii) the construction work was carried out in accordance with the management plan.

Pipeline construction activity will result in a temporary increase in noise levels within the immediate vicinity of the alignment, associated with the operation of vehicles and equipment such as excavators, graders, bulldozers and boring equipment. However, this impact is expected to be of short duration and intensity. It is not anticipated there will be any requirement for blasting to be carried out.

Construction of the Loop 10 Looping pipeline will be undertaken in compliance with Part 2, Regulation 7 of the *Environmental Protection (Noise) Regulations 1997*.

Fauna

The presence and activity of construction activity may result in temporary, short-term disturbances to fauna (e.g. noise may discourage critical lifecycle stages such as breeding or nesting). However the short duration of construction activities is not expected to have any significant impact on fauna. As discussed in Section 3.5.4, construction activities are not expected to have any prolonged impact on fauna.

5.2.7.2 Impact Mitigation

To mitigate potential noise impacts, ANS will:

- schedule normal construction near residences in accordance with respective WA DoE recommendations and as far as practicable, restrict noisy activities to normal working hours
- consult with local residents when unavoidable out-of-hours work is required
- select appropriate equipment
- fit and maintain appropriate mufflers on earth-moving equipment and other vehicles on the site
- use drilling equipment with noise ratings suitable for use on public roads.

5.2.8 Air Emissions

5.2.8.1 Potential Impacts

Atmospheric dust will be the main component of air emissions during the construction phase of the proposed development, principally from clearing and grading, trenching, backfill and reinstatement and vehicle movement. The impacts of dust generation will be short term.

Other minor sources of air emissions include exhaust fumes from earthmoving and transport equipment. However, these sources are likely to be negligible in the context of existing land use, transport and residential land uses of the Project area. No measurable impact is likely.

Impacts to air quality as a result of dust generation and atmospheric emissions are expected to be negligible, short term in duration and not have any impact upon personnel, the public or fauna.

5.2.8.2 Impact Mitigation

To minimise the impacts, the mitigation measures shall include the following:

- minimise the extent and period of exposed soil surfaces
- use of water trucks and sprayers to dampen down the soil during construction
- rehabilitate exposed surfaces as rapidly as practicable
- keep all construction vehicles and equipment well maintained and comply with vehicle emission standards

- monitor operations to ensure compliance with design requirements
- implement a program of regular monitoring, inspection and maintenance during operations to prevent pipeline rupture and reduce the occurrence of minor leaks from pipeline infrastructure.

5.2.9 Land Use

5.2.9.1 Potential Impacts

Pipeline construction has the potential to temporarily disrupt land use activities as a result of the disturbance of land on the AOD and the presence of vehicles and machinery. In particular the following construction activities have the potential to affect land use activities within the Project area:

- construction access
- earthworks
- welding
- materials transport and storage
- the storage and handling of small quantities of fuel and chemicals.

The potential impacts on land use as a result of pipeline construction activity include:

- temporary loss of land utilisation for agriculture or horticultural uses
- temporary loss of areas for the agistment of livestock
- reduction in long-term productivity due to soil compaction, inversion, contamination or erosion
- introduction, spread or colonisation of weeds, pathogens and/or agricultural diseases
- restriction in stock movement and possible stress to livestock
- impeded property access
- wildfire from welding activities
- increase in local traffic numbers and use of roads

These impacts can be successfully managed to avoid significant impact. These impacts are generally temporary in nature and cease once the construction phase of the Project has been completed and the AOD has been rehabilitated. However, poor soil management or the introduction of weeds and diseases can impair long-term productivity.

The operation of the gas pipeline will generally not impact existing land use, as the pipeline will be buried and the AOD rehabilitated to as near as practicable to the pre-construction state. Existing land use activities will generally not be restricted over the pipeline except for those that will potentially cause harm to the pipeline or the public (for example, water bore installation, blasting, fence post installation, deep ripping in areas where it has not been specifically approved and planned for and planting of deep rooted plants).

Access along the easement will be consistent with existing practices, and as such no change in impact is anticipated. Access to the easement during construction will generally be along existing tracks. Any new tracks created will be rehabilitated following construction unless required by the landowner.

5.2.9.2 Impact Mitigation

The DBNGP Expansion Project Team has a responsibility and obligation to deliver the project with minimum disruption to the Landowners affected by both pre-construction and Construction activities.

A function of the Land Management Team is the initial (and ongoing) communication with landowners advising them of every aspect of the project that is likely to affect them. The importance of this responsibility is clearly recognised and is the basis of the Land Management Plan.

Land Management Processes

- communicate accurate information to landowners and other stakeholders on a timely basis, and respond to concerns and issues as they arise
- retain experienced resources to undertake the work
- planning pre construction activities with input from all Project disciplines
- checking with all Project disciplines on what commitments are achievable
- ensuring all agreements are in writing
- reporting progress outcomes and issues regularly.

Land Management Activities will include

- understanding of land use current and future – what to design for – deep ripping, future irrigation levelling etc
- suitable work areas to allow prompt safe construction
- clear understanding of how to gain access to the aod – public roads, along aod, or private track
- understanding of when access is to be available, and specific approvals requirements
- understanding of process for planning of pre-construction activities – surveys, test holes site inspections etc.

More specifically ANS will:

- enter into formal easement agreements outlining the legal responsibilities of both ANS and the landowner
- work closely with landowners and managers to minimise conflict with existing land use activities
- where possible, avoid construction activities during key periods or, if not practicable, consult with landholders to coordinate activities
- implement appropriate quarantine measures and weed, pest and disease control and management protocols during construction and operations, in consultation with landowners and relevant management authorities. These will include:
  - washdown / decontamination of vehicles and machinery before Project commencement
  - screening of imported material (e.g. padding) or extraction sites for weeds and pathogens
  - not grading topsoil over property boundaries
  - implementing hygiene procedures (e.g. washdown) at property boundaries if required
  - post-construction weed control if required
- rehabilitate the construction AOD in consultation with landholders
- implement appropriate erosion and sediment control measures
- develop and implement appropriate traffic management procedures
- ensure fire prevention and response equipment is present on-site for relevant activities (e.g. welding)
- consult with local Shires and obtain relevant permits to work on fire ban days.

5.2.10 Third-party Infrastructure

Impacts to third party infrastructure can be mitigated through careful pre-construction planning and appropriate consultation with relevant regulatory authorities, public utility service companies and landholders. With adequate management the following impacts can be prevented:

- disruption or damage to road and other transport infrastructure or networks
- disruption or damage to utility services
- disruption or damage to private third party property.

5.2.10.1 Potential Impacts

Transport Networks

The following Project activities may disrupt or damage transport networks:

- use of roads during construction by extendable semi trailers delivering stockpiles of pipe to worksites
- use of roads by low loaders mobilising construction equipment between worksites
- transporting of construction personnel to worksites
- open cut crossings of unsealed roads
- pipeline surveillance and maintenance activities.

With adequate management the following potential impacts to the transport network can be avoided or adequately managed:

- loss of road integrity
- localised traffic congestion or disruptions.

It has been estimated that approximately 160 deliveries will be required for the Looping 10 Pipeline, transported by extendable semi trailers. Impacts of pipe and equipment transportation during the construction period include slow moving traffic on roads and subsequent disturbance to local traffic and motorists.

It is anticipated that there may be some localised traffic disruptions associated with road crossings as standard open cut road-crossings can typically take up to six hours.

Heavy vehicle and equipment movement may result in localised damage to the integrity of the road pavement or surface (that is through wear-and-tear). Boring beneath sealed roads will not cause damage to road integrity.

Inspection of the AOD will be required during pipeline operations. However, it is expected that inspections will be undertaken by four wheel drive vehicles and by aerial inspection. Impacts to roads or traffic conditions are considered negligible.

Public Utilities

The Looping 10 Pipeline will not result in significant impacts to public utility services. Utilities will be identified prior to construction and incorporated into construction line lists and appropriately flagged, earthed, protected and avoided during construction. Should the construction of the pipeline perforate, rupture or incise cables, pipes or other utility infrastructure, short term disruptions to services such as electricity, water and telecommunication networks may occur.

Utility infrastructure may also pose safety risks to personnel during construction, in particular induced current and direct contact with ‘live’ wires arising from placement and movement of construction equipment and large metal objects in parallel and close proximity to power lines. Arcing between transmission lines and construction plant equipment and vehicles may also occur if required separation distances are violated.

Private Property

Impacts to private property will be necessary as part of the normal construction process, but will occur with the prior knowledge and approval of the landholder. Such impacts include cutting fences and installing temporary gates, and modifications to existing gates or driveways. Damage will be avoided where practicable and made good on Project completion if unavoidable.

5.2.10.2 Mitigation Measures

Transport

To reduce the effects of transport network disturbances, ANS will implement the following mitigation measures:

- plan equipment and material transport routes and storage areas in consultation with local and state authorities to minimise disruption to residents and industry
- deliver Project related equipment during daylight hours, where practicable
- implement a traffic safety management plan
- reinstate open cut roads to the satisfaction of the local authorities
- address any damage caused to roads or bridges caused by construction or associated activities
- where practicable, use shuttle buses to transport personnel to worksites.

Public Utilities

To reduce the effects of disturbances to public utilities, ANS will:

- maintain close liaison with utility companies to identify existing overhead and buried cables, lines, pipes and water mains
- obtain standard clearance for services from various authorities
- use preventative flagging to mark the location of services and infrastructure
- appropriately earth equipment and pipe at established intervals
- where possible, cross transmission easements at or near 90 degrees and well away from structures.

Private Property

To reduce impacts to private property, ANS will:

- maintain close liaison with all affected landowners
- appropriately note agreed impacts or modifications on the line list
- obtain pre-construction agreement on the type and extent of impact to occur
- obtain pre-construction agreement regarding strategies and responsibilities for rectification of, or compensation for, damage.

5.2.11 Public Safety and Risk

Pipelines are recognised as a safe and efficient means of transporting natural gas. However, all developments present some level of risk.

A detailed risk assessment has been carried out in accordance with AS 2885.1 and will result in the application of a combination of physical and procedural measures to ensure that the pipeline design, construction, operation and maintenance and management meet appropriate safety standards.

The risk assessment involved the identification of all credible threats to the pipeline at all locations along its length. A credible threat to the pipeline can be assumed to include any element which can plausibly cause pipeline failure, including threats due to location (including crossing and land use segments) and general threats common to the entire system (for example, corrosion). The location analysis will consider land use related activities (for example, land usage) and crossing segments (for example, main sealed roads, rail crossings, utilities and waterways).

All identified threats presenting an unacceptable level of risk will be mitigated through the adoption of the requirements under AS2885.1. Mitigation considers threats due to external interference (deliberate and accidental) as well as threats due to unsatisfactory design, construction, materials and operations. Threats due to natural events such as erosion and lightning were also considered.

Table 5-2: Pipeline Protection Safety Measures

Methods	Measures	Description
Physical Measure	Burial	The entire pipeline will be buried at depth in accordance with AS2885.1.
	Barrier/Slab	Crash barriers and concrete slabs will be adopted where risks are not sufficiently mitigated (e.g. within railway easements).
	Exclusion	Fences will be installed where necessary to limit access by unauthorised personnel.
	Wall thickness	Wall thickness is increased where higher levels of risk to pipeline integrity exist or the consequences of rupture are considered unacceptable (e.g. populous centres).
	Barrier to Penetration	Other physical barriers may be used to protect the pipeline such as coating or encasing.
Procedural Measure	Liaison – Contractors	Organisations, such as councils, utility or major agriculture/community groups that may present a threat to the pipeline will be contacted.
	Marker Signs	Pipeline signs will be posted in accordance with AS 2885.1 (Clause 4.2.5.4. (a)(ii).
	Marker Tape	Buried marker tape will be installed above the pipe in accordance with the risk assessment under AS 2885.1.
	Liaison – Landholders	Landowners will be contacted on an ongoing basis throughout Project development, construction and operation.
	One-call (Dial before you dig)	Pipeline incorporated in a one call network for efficient processing of public inquiries and enabling an effective pipeline reporting mechanism.
	Patrolling	Quarterly patrolling of the entire route throughout the life of the pipeline.

5.2.12 Waste Management

Relatively small amounts of domestic and industrial wastes will be generated during the construction and operation of the Looping 10 Pipeline.

Specific mitigation and procedural measures to be adopted by ANS include:

- develop specific waste management strategies for each waste stream prior to the commencement of any waste producing activities, based on the principles of “Reduce, Reuse, Recycle” and appropriate disposal
- inform site personnel of the required waste management procedures during the workforce induction program
- manage hazardous wastes, such as solvents, rust proofing agents and primer, in accordance with the requirements of relevant legislation and industry standards
- instruct all personnel in Project waste management practices as a component of the environmental induction process
- dispose of all hydrotest water in accordance with the CEMP
- place a high emphasis on housekeeping and cleanliness at the site . All work areas will be maintained in a neat and orderly manner
- collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations
- store and handle chemicals in accordance with Section 5.2.13
- remove all waste material from the worksite on completion of each section of the pipeline.

5.2.13 Hazardous Storage, Spill and Emergency Response

A variety of chemicals may be required on-site for the construction of the Looping 10 Pipeline. These include fuel, lube oils, solvents, rust proofing agents and primer. Potential impacts

include contamination to soils and water resources and other environmentally sensitive values. Such impacts have been detailed in Sections 5.2.1 and 5.2.2 respectively.

Mitigation measures undertaken by ANS to reduce the effects of hazardous substances and spill events to the environment and third parties will include:

- hazardous material will be securely stored and handled to ensure it cannot drain onto the ground or to watercourses, wetlands or floodplains
- appropriate storage (e.g. bunding as per regulatory guidelines) of all fuels and hazardous materials used on-site
- materials and equipment required to respond to a hazardous spill will be readily available
- development of procedures for emergency response
- appropriate implementation of cleanup/spill response procedures if the event of a spill
- Material Safety Data Sheets will be kept for each chemical used on-site and at a location that is easily accessible 24 hrs per day
- all Project personnel on will be instructed on prevention, safety and response practices as a component of the environmental induction process.

5.2.14 Fire Risk Management

Activities including welding and grinding that create sparks may potentially start fires during the construction operation.

Specific mitigation and procedural measures to be adopted by ANS include:

- Alinta and its contractors shall maintain regular liaison with local emergency service organisations
- open fires (including bbq's, billy fires, brush burning and rubbish burning) will be banned
- clearing of the easement will provide some separation distance from fuel sources
- note: there will be not be any fire breaks on AOD as this would require additional clearing
- fire weather warnings will be monitored daily
- vegetation will be stockpiled well clear of the hot work activities areas
- all vehicles will be fitted with dry chemical extinguishers (light vehicles with 1kg units, trucks etc 9kg units).
- all extinguishers will be tagged by an approved inspector prior to mobilisation
- the service truck shall be fitted with both a 9kg foam extinguisher and a 9kg chemical extinguisher
- the welding rig will be fitted with a 900 litre capacity tank for fire fighting purposes
- a water cart (approx 4000-5000 litre capacity) with fire fighting capacity will be on site for the duration of construction
- welding assistants will be alert for any evidence of spot fires
- all welding and grinding will be undertaken using methods to contain any sparks
- a water cart will be available with the welding crew, all appropriate crew members will be trained in the use of fire fighting equipment
- all machinery shall be maintained and operated to comply with relevant fire safety standards
- defective machinery shall be shut down until the defect is rectified and the machine made safe for operations
- regional fire bans shall be adhered to when applicable or permits obtained to work on fire ban days where necessary.

6 Stakeholder Consultation

Consultation has been undertaken with various stakeholders including government agencies as listed in Table 6.1. Further consultation is planned during the development of the CEMP.

The DBNGP Expansion Project Team has a responsibility and obligation to deliver the project with minimum disruption to the Landowners affected by both pre-construction and Construction activities.

A key aspect is the initial (and ongoing) communication with landowners advising them of every aspect of the project that is likely to affect them. The importance of this responsibility is clearly recognised and is the basis of the Land Management Plan. The land management processes and activities include the following aspects.

Land Management:

- communicate accurate information to landowners and other stakeholders on a timely basis, and respond to concerns and issues as they arise;
- retain experienced resources to undertake the work;
- planning pre construction activities with input from all Project disciplines;
- checking with all Project disciplines on what commitments are achievable;
- ensuring all agreements are in writing;
- reporting progress outcomes and issues regularly.

Land Management Activities will include:

- Understanding of land use current and future – what to design for – deep ripping, future irrigation levelling etc;
- Suitable work areas to allow prompt safe construction;
- Clear understanding of how to gain access to AOD – public roads, along the AOD or private tracks;
- Understanding of when access is to be available and specific approvals requirements; and
- Understanding of process for planning of Pre-construction activities – surveys, test hole site inspections etc.

It is the intention of ANS to undertake further consultation with key government agencies and land holders. Non- Government Organisations (NGO's) consulted to date include the Wildflower Society. Specifically for Looping 10, the project team has consulted with those listed in the Table 6-1 below.

Table 6-1: Stakeholder Consultation

Agency/Group	Topic/ Legislation	Comments	How/Where Addressed
EPA Services Unit	*Environmental Protection Act 1986*	Flora survey, S 38 Referral etc	This ARI
CALM	Flora	Rehabilitation scope and methodology, spring survey requirements Rehabilitation Plan	Appendix 3
	Fauna Handling	Require Regulation 17 License to Take Fauna approval. Methods for removal and relocation of fauna from trenches and tree and euthanasia of injured, orphaned and pest species.	Section 3.5.4 of ARI CEMP
DoIR	GPWG SER	SER Process and stakeholders involved.	
	Project Facilitation	Looping 10 is not required to be managed under the DoIR Project Facilitation Process.	
	Design Risk Assessment in relation to adjacent landowners, occupancy, physical threats to the pipeline and environmental impacts.	Will be included in design.	Section 5.2.11
Serpentine/ Jarrahdale Shire	Local shire requirements (eg bushfires/ dangerous goods storage)	The Shire will liaise with all other local shire fire chiefs to inform them of construction activities.	Section 5.2.11
DOE	Environmental Protection Act 1996 Rights in Water and Irrigation Act 1914	Discussions on: ▪ Dewatering ▪ Serpentine River Crossing ▪ Contaminated Sites ▪ Hydrotesting ▪ etc.	Section 5.2.1; Section 5.2.2
	Acid Sulphate Soils	Need to conduct geological and hydrological assessment of looping locality to identify risk areas	Section 5.2.1
	Contaminated sites	Clarification on legislation and any potential	

Agency/Group	Topic/ Legislation	Comments	How/Where Addressed
		sites	
DPI	Bush Forever	Sort copy of referral and will liaise via EPA Service Unit: rehabilitation	Section 3.5.3
	DBNGP access issues	Clarifying legal aspects of corridor access	
	Status of Govt Corridor expansion and availability existing corridor for this looping project.	DPI ascertaining clearance for use of easement..	
Town of Kwinana	ERA Workshop		Section4
City of Rockingham	Design Risk Assessment in relation to adjacent landowners, occupancy, physical threats to the pipeline and environmental impacts.		Section 5.2.11
Office of Energy	ERA Workshop		Section 4

7 Environmental Management Framework

7.1 Environmental Management System

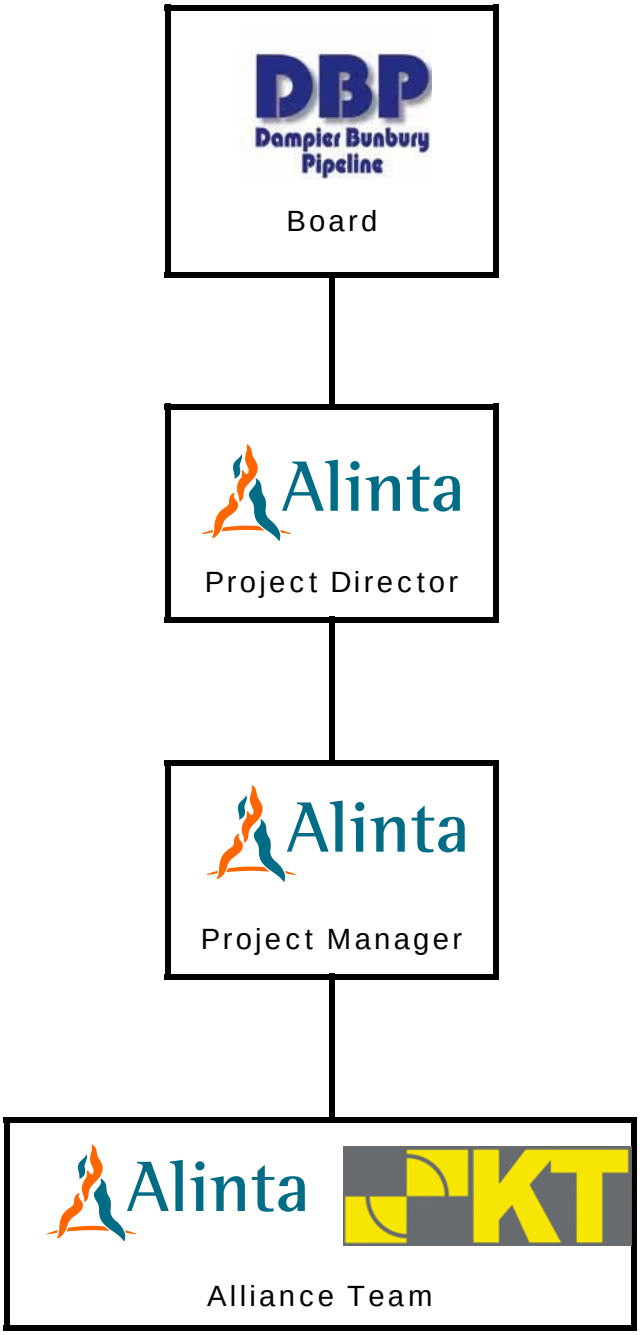
The feasibility, planning and assessment of the Looping 10 pipeline has been undertaken under the ANS's Environment Management System (EMS) which comprises the following elements:

- A corporate policy stating commitment to conduct activities in an environmentally responsible manner
- Clearly stated objectives consistent with this commitment
- Practical procedures to achieve the objectives
- Clearly defined responsibilities for personnel to indicate their obligations regarding environmental management
- Appropriate induction and training of personnel
- Comprehensive monitoring and auditing programs to assess compliance with procedures and the achievement of objectives
- A system of reporting for recording of data and notification of relevant personnel
- Ongoing consultation to seek input from and inform all parties of relevant issues.

The EMS is based on the principles of ISO14001: Environmental Management Systems. In addition to the EMS a number of Project specific documents are being prepared including a Construction Environmental Management Plan which includes the training, induction and auditing program. Information on these components is provided in the following sections.

7.1.1 Responsibilities

Environmental management and compliance will be the responsibility of all personnel involved on the project. The project will be constructed under an Alliance between Alinta and KT Pipelines. The structure of the relationship between the parties involved from the Proponent to the Alliance Partnership is outlined in the chart below.



The overall responsibility for environmental compliance lies with ANS. ANS will maintain a high level of on-site supervision of the construction contractor and the environmental performance of potential contractors will be reviewed as part of construction tender evaluation. The construction contractor(s) and individuals will also be responsible and accountable through their conditions of employment or contract. The training of all personnel involved in the pipeline construction will ensure that each individual is aware of their environmental responsibility.

7.1.2 Induction and Training

All personnel involved with the construction and operation of the Looping 10 Pipeline will be required to complete environmental induction and training prior to commencing work. The

objective of the training will be to provide Project personnel with the necessary training to allow them to recognise and effectively manage the environmental aspects of the Project.

The environmental training program will involve the discussion of a variety of issues including:

- relevant legislation and legislative requirements
- roles and responsibilities
- environmental issues for the Project, including:
  - management of sensitive areas
  - erosion and sediment control
  - protection of water quality
  - vegetation and habit management
  - interaction with fauna
  - weed and pathogen control
  - heritage management
  - protecting existing utilities, infrastructure and the amenity of landholders
  - traffic and access
  - waste management
  - fire management
  - emergency response
- Project documentation (including the CEMP, alignment sheets, technical drawings and other associated documents)
- incident reporting.

An environmental training register will be maintained to ensure that all personnel are trained prior to access to the Project AOD. All personnel will complete a training verification test, which will be reviewed and assessed by the trainer prior to signing of the training register.

7.1.3 Environmental Inspection

During construction the pipeline route and construction activities will regularly be inspected and reported upon to ensure compliance with the Construction Environmental Management Plan and other environmental requirements. ANS will have a representative on site to supervise flagging of environmental features on the AOD (e.g. trees) and clear-and-grade operations, as well as other key activities.

7.1.4 Monitoring

Photographic environmental monitoring points will be installed at a number of locations along the pipeline route. Photographs will be taken at each of these sites prior to the commencement of various stages of the construction cycle and after reinstatement, to provide a visual record of the progress of construction and compliance with environmental objectives.

7.1.5 Auditing

It is proposed that one environmental audit will be undertaken during the construction of the Looping 10 Pipeline.

The audit will be undertaken during the first construction cycle in order to check compliance with the CEMP, the Statement of Environmental Objectives and legislative requirements. This will enable non-conformances to be identified and preventative action implemented to prevent repetition. The audit will include all work areas.

Regular audits will also be undertaken during the operation of the pipeline, with the first occurring 12 months after the completion of construction.

7.1.6 Records and Reporting

During all phases of the Project an appropriate and auditable record system will be maintained. Environmental reporting will be conducted in accordance with licence conditions.

Environmental records will include:

- non-conformance reports
- remedial actions taken following incident reports
- inspection reports
- training and induction attendance
- consultation records and meeting notes
- audit reports
- monitoring results.

Environmental incidents and identified instances of non-compliance will be recorded and reported on a non-conformance report proforma.

7.1.7 Preventative and Corrective Action

The purpose of the CEMP is to identify and manage environmental risks and impacts. This will be achieved through the elements described above. If unforeseen events or system failures occur, the CEMP will provide for prompt identification, review and response, to minimise impacts and prevent reoccurrence. Formal reporting and corrective action will include the use of non-conformance reports and corrective action requests.

7.2 Environmental Management Plans

7.2.1 Construction and Operation EMPs

Under the *Petroleum Pipelines Act* 1969, ANS is required to submit a CEMP prior to the commencement of construction and an Operational EMP (OEMP) prior to commissioning, to DoIR for approval.

The CEMP is being developed for the construction phase of the pipeline project. This CEMP will be consistent with the Australian Pipeline Industry Association (APIA) Code of Environmental Practice (APIA 1998) and will provide guidance on the environmental aspects and management of the environmental impacts of the Project. It will also provide a summary of legal and community requirements and the responsibilities of all levels of personnel involved with the Project.

The CEMP will contain the following information:

- Project overview
- Environmental commitment & project EMS
- Statutory requirements and environmental legislation
- Environmental aspects and impacts
- Environmental Risk Assessment
- Environmental objectives
- Environmental responsibilities
- Training requirements
- Reporting
- Auditing
- Environmental Management Protocols.

7.2.2 Issue Specific Management Plans-Rehabilitation

Rehabilitation of the Looping 10 Pipeline corridor will depend on the current landuse eg cleared agriculture land versus native vegetation as found at Leda Nature Reserve. The issues relevant to rehabilitation include:

- Weed management
- Priority and Rare Flora management
- Resource management (topsoil and vegetation material)
- Soil profile and final landform
- Establishment of native vegetation

The rehabilitation process will include the following key steps:

- Removal of existing invasive weeds on the easement where appropriate (see Section 5.2.4)
- Weed hygiene (see Section 5.2.4)
- Protection of existing Declared Rare and Priority flora on the easement where possible (see Section 5.2.3)
- Clearing and storing of native vegetation (see Section 5.2.3).
- Removal and storage of topsoil (see Section 5.2.1).
- Removal and storage of trench spoil (see Section 5.2.1).
- Reconstruction of the soil profile following pipe laying (see Section 5.2.1).
- Respreading of topsoil. (see Section 5.2.1)
- Respreading of stored vegetation material (see Section 5.2.3).
- Application of native seed (see Section 5.2.3).
- Ongoing weed management and monitoring (see Section 5.2.4).

Completion criteria will be included in the Plan and will be audited.

The details of the Rehabilitation Management Plan have been developed with input and advice from CALM and the results have been incorporated within the CEMP.

7.3 Environmental Performance Objectives

A number of environmental objectives have been developed for this Project, based on the information and issues identified in the development of this document. These objectives have been designed to provide a clear guide for the management of environmental issues during the construction of the pipeline and will be incorporated into the CEMP. The objectives and associated management criteria are provided in Table 7-1.

Table 7-1: Environmental Objectives and Management Criteria

Issue	Objective	Goal	Management Measures	Assessment
Soils and Terrain	1. To avoid or minimise adverse impacts on soils and terrain	1.1 To minimise soil erosion and sedimentation as a result of pipeline construction	Construction Environmental Management Plan (CEMP) contains environmental work measures that specify soil management and reinstatement requirements Preventative measures implemented and monitored in susceptible areas Erosion and sedimentation control structures installed and maintained in susceptible areas Records of induction/training regarding CEMP requirements Regular inspections of construction areas undertaken to look for evidence of erosion	The extent of soil erosion on the AOD is consistent with surrounding land
		1.2 To prevent soil inversion	CEMP requirements include separate stockpiling of topsoil and sub-surface material during excavation Records of induction/training regarding CEMP requirements Reinstatement of stockpiles in appropriate order during backfill Implement reinstatement requirements specified in CEMP	No evidence of subsoil on surface (colour)
		1.3 To mitigate soil compaction if necessary by remedial action	Ripping of identified compacted areas Regular inspections undertaken of easement and construction areas to look for evidence of soil compaction	No visual evidence of soil compaction following remediation of pipeline easement
		1.4 To mitigate impacts of exposing potential acid sulphate soils (ASS)	Identification of areas of potential acid sulphate soils Implementing CEMP management procedures for potential acid sulphate soils Monitor groundwater quality via piezometers	No evidence of impacts of acid sulphate soil exposure (odour, discolouration, vegetation death) No negative impacts identified from disruption of ASS through groundwater monitoring

Issue	Objective	Goal	Management Measures	Assessment
		1.5 To reinstate soil and terrain to pre-construction contours and conditions	Implement reinstatement requirements specified in CEMP Records of induction/training regarding CEMP requirements Regular inspections undertaken of easement and construction areas Installation and monitoring of photo points (environmental monitoring points)	Surface contours consistent with adjacent land
Water Resources	2. To minimise and manage impacts to water resources	2.1 To minimise short term, and prevent long-term, interruption or modification to surface drainage patterns and groundwater levels	Management requirements specified in CEMP Records of induction/training regarding CEMP requirements Installation and monitoring of photo points (environmental monitoring points) Regular inspections undertaken of AOD and construction areas specifically to look at watercourse crossings and wetlands Installation and monitoring of photo points (environmental monitoring points) Instillation of ground water monitoring bores (piezometers)	No adverse impacts (for example to downstream ecology or land use) resulting from waterbody flow reductions or diversions as a result of pipeline construction activities No evidence of altered watercourse flows following reinstatement No evidence of project related erosion of watercourse intersecting or adjacent to the pipeline AOD Surface drainage profiles restored Drainage is maintained to pre-existing conditions or better No long term change to groundwater levels
		2.2 To minimise the amount of sediment entering surface water features	CEMP specifies management requirements including: ▪ No stockpiling of materials in watercourses/flowlines ▪ Use of appropriate sediment and silt capturing devices ▪ Installation of permanent berms on slopes ▪ Minimising period between clearing and reinstatement at or near	Compliance with the *Environment Protection Act 1986* Release of sediment into surface water features is reduced to as low as reasonably practicable

Issue	Objective	Goal	Management Measures	Assessment
			watercourses/wetlands ▪ Stabilisation, reinstatement and revegetation of watercourses, wetlands and drainage lines Records of induction/training regarding CEMP requirements	
		2.3 Minimise disruption to third party use of surface waters	Liaison with third party users regarding potential disruptions Minimising period of disturbance and prompt reinstatement in sections of easement intersecting or adjacent to water bodies Installation and subsequent removal of appropriate temporary watercourse/water body protection measures to prevent flow interruptions	No reasonable complaints received from landholders or third party users in relation to use of surface waters
Contamination and Waste Management	3. To avoid land or water contamination	3.1 To prevent spills occurring	Use of spill protection methods where work is completed within or adjacent to environmentally sensitive areas Spill response/cleanup procedures, requiring spills to be: ▪ Reported ▪ Contained ▪ Cleaned-up ▪ Cause investigated and corrective and/or preventative action implemented Ensuring personnel are trained in spill response procedures Incident / Spill reports Containment of all hazardous substances and liquid waste in appropriate vessels/containment areas Compliance with fuel and hazardous waste standards Regular inspections for evidence of soil or water discolouration, vegetation or fauna death	No spills or leaks to areas not designated to contain spills No reported incidents

Issue	Objective	Goal	Management Measures	Assessment
		3.2 To ensure that rubbish and waste material are disposed of in an appropriate manner	Adopt waste management strategies for each waste stream prior to the commencement of any waste producing activities, based on the principles of "Reduce, Reuse, Recycle" Waste management requirements including removal of all waste specified in CEMP Regular inspection to look for evidence of rubbish, spills (soil discolouration) Waste disposal records, chemical manifests Appropriately licensed contractors used for any hazardous waste disposal and records are maintained for all hazardous waste disposal	Minimal creation of waste No rubbish or litter on AOD or at facilities Waste material is contained and disposed of in accordance with *Environment Protection Act 1986* No reported incidents
		3.3 To prevent adverse impacts as a result of hydrotest water, trench water and waste water (washdown water) disposal	Water disposed of in a manner that prevented discharge or runoff to watercourses or waterbodies or environmentally sensitive areas Water disposed of in a manner that prevented discharge or runoff to watercourses or environmentally sensitive areas Water discharged onto stable ground, with no evidence of erosion as a result of discharge Records on source of water and discharge method/location Testing of salinity and/or water quality prior to release/disposal of trench water and waste water. Inspection of water disposal sites for evidence of water entering a watercourse or environmentally sensitive area	Discharge water meets appropriate criteria for point of disposal No evidence of impacts to soil, water and vegetation as a result of water disposal (i.e. soil erosion, dead vegetation, water discoloration)
Flora and Fauna	4. To minimise adverse impacts to vegetation and fauna	4.1 To minimise and where practicable avoid clearing of remnant vegetation	Utilise previously disturbed areas to avoid remnant vegetation Identify remnant vegetation requiring management/avoidance Flagging/marking of remnant vegetation requiring management/avoidance	All areas of remnant vegetation avoided where practicable

Issue	Objective	Goal	Management Measures	Assessment
			Retain trees on AOD where possible Trim vegetation in lieu of removal where possible Obtain any permits / clearance consent required Restrict disturbance the AOD and approved access and work areas	
		4.2 To minimise disturbance to fauna	Implement previous measures to minimise impacts to native vegetation Identification and flagging of significant fauna habitats that require management/avoidance during construction and implementation of management requirements Alignment selection to minimise/avoid impacts to important nesting/breeding habitats Provision of fauna ramps at regular intervals in open trench Daily inspection of open trenches in areas adjacent to remnant vegetation Prompt reinstatement and revegetation of cleared native vegetation	Records of fauna entrapment and release Native fauna casualties associated with construction restricted to be as low as reasonably practical
		4.3 To appropriately rehabilitate the easement to pre-construction condition, as reasonably practical	Revegetation of areas on the AOD where remnant vegetation has been cleared during construction with appropriate local native species Installation and monitoring of photo points (environmental monitoring points)	Species abundance and distribution on the AOD is consistent with the pre-construction conditions Note: assessment of the consistency with surrounding areas will take into account that regrowth is a time and rainfall dependent process

Issue	Objective	Goal	Management Measures	Assessment
Noxious Weeds, Pathogens and Pest Species	5. To avoid the introduction or dispersal of weeds and pathogens and pest species.	5.1 To avoid the spread of environmental/proclaimed weeds and animal and plant pathogens and undertake control where required	Vehicles and machinery cleaned and inspected before entry to project area Vehicle cleaning/washdown register Identification of weeds and pathogens on AOD and adjacent land Implementation of control measures of weeds and pathogens on AOD Records of outbreaks found, weed control activities and photo-monitoring of significant outbreaks	The presence of weeds, pathogens and pest species on the easement is consistent with or better than adjacent land No new outbreak or spread of pathogens
Cultural Heritage	6. To minimise and manage impacts to heritage sites and values during construction	6.1 To ensure that identified heritage sites are not disturbed, including archaeological heritage, built heritage and culturally significant vegetation	Heritage Management Agreement in place prior to construction commencing. Identification of known heritage sites on AOD Surveys / cultural heritage monitoring during clear and grade in sensitive areas Implement appropriate protocols for dealing with accidental discovery of cultural heritage material during construction Obtain all necessary approvals in the event of an accidental/unavoidable site disturbance Seek advice from relevant authorities for remediation of site, if required Incident reports	No impact to known sites without approval Comply with Heritage Management Agreement Any new sites identified are reported to appropriate authority and recorded
Noise	7. To minimise noise due to construction	7.1 To minimise noise impacts associated with the movement and operation of construction vehicles and equipment	Schedule normal construction activities near residences in accordance with EPA guidelines Consult with local residents when unavoidable out-of-hours work is required Regular maintenance of construction vehicles and equipment	No reasonable landholder complaints Compliance with EPA Noise guidelines

Issue	Objective	Goal	Management Measures	Assessment
Air	8. To minimise atmospheric emissions	8.1 To minimise the generation of dust	Management requirements specified in CEMP including use of water trucks and sprayers if necessary Records of induction/training regarding CEMP requirements	No reasonable complaints received
Landuse	9. To minimise disturbance to third party infrastructure, landholders and land use	9.1 To minimise disturbance or damage to infrastructure / land use and remediate where disturbance cannot be avoided	Implement CEMP requirements Restrict disturbance the AOD and approved access and work areas Identification of utilities present on or near the easement on alignment sheets Records of communications with landholders / 3rd party prior to and during construction activities Incident reports	Where disturbance is unavoidable or accidental, infrastructure or land use is restored to the satisfaction of the landholder/owner or to undisturbed condition No disturbance outside the AOD and approved access and work areas Duration of disturbance does not exceed agreed timeframe No reasonable complaints received
		9.2 To minimise disturbance to landholders	Restrict disturbance the AOD and approved access and work areas Records of communications with landholders prior to and during construction activities	No reasonable landholder complaints Landholder activities not restricted or disturbed as a result of pipeline activities unless by prior arrangement
		9.3 To appropriately reinstate and rehabilitate the easement to allow continuation of current land use activities post-construction	Management requirements specified in CEMP and property line list Re-seeding of AOD with appropriate pasture or crops or plant species Records of communications with landholders prior to and during construction activities Installation and monitoring of photo points (environmental monitoring points)	Vegetation cover on the easement consistent with the surrounding area or as agreed with landholder Note: assessment of the consistency with surrounding areas will take into account that regrowth is a time and rainfall dependent process

Issue	Objective	Goal	Management Measures	Assessment
Public Risk	10. To minimise the risk to public health and safety	10.1 To adequately protect public safety during construction	Job Hazard Analysis Records of communications with adjacent landholder and 3rd Parties prior to and during construction work including advice of the nature and schedule of activities Use of signage or bunting to identify all potentially hazardous areas Site induction program for all personnel / visitors Adequate implementation of traffic management practices Records of Fitness for Purpose Reports, Risk Assessment and inspections Records demonstrating compliance with AS2885 Records of emergency response plan induction/training for construction personnel Incident Reports	No injuries or incidents involving the public
		10.2 To avoid fires associated with pipeline construction activities	Records of regular fire safety and emergency response training for construction personnel Appropriate fire prevention/control equipment on site Records of relevant permits from local fire authorities Incident Reports	No pipeline construction related fires

8 Abbreviations

AIC	Australian Interaction Consultants
AOD	Area of Disturbance
ASS	Acid Sulphate Soil
AASS	Actual Acid Sulphate Soil
CALM	Department of Conservation and Land Management
DEH	Department for Environment and Heritage
DIA	Department of Indigenous Affairs
DOIR	Department of Industry and Resources
DOE	Department of Environment
DPI	Department of Planning and Infrastructure
DRF	Declared Rare Flora
ELL	Environmental Line List
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Authority
EPP	Environmental Protection Policy
KP	Kilometre point (unit of measurement along section of pipeline)
MLV	Main Line Valve
PASS	Potential Acid Sulphate Soil
ROW	AOD or AoD

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Personal Communications

Julie Palich, Parsons Brinckerhoff Australia Pty Limited (2005)

Thomas Grosjean, GHD Pty Ltd (2005)

Appendix 1: Location Maps

Map 1a: Looping 10 Pipeline Locality Plan – Broad Scale

Map 1b: Looping 10 Pipeline Site Plan – Existing Environment

Appendix 2: Geomorphic Wetlands

Figures 1-7: Aerial Photos and Geomorphic Wetland Locations

Appendix 3: Flora Reports and Rehabilitation Management Plan

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Appendix 4: Fauna Report

MJ & AR Bamford Consulting Ecologists (2003) *Kwinana-Bunbury Gas Pipeline Fauna Review* – Prepared for BBG

Appendix 5

Parsons Brinckerhoff Australia (2005) *DBNGP Looping 10 Acid Sulphate Soil Risk Classification and Preliminary Site investigation Sample and Analysis Plan.*

Appendix 6

Restricted Working Width Areas in Environmentally Sensitive Areas