APA Group

Pipeline Licence 7 - Moomba to Sydney Pipeline

GORODOK
ETHANE PIPELINE

Pipeline Licence 8 – Ethane Pipeline

Environmental Impact Report
(Operations)

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RPS

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1 Introduction

1.1 Background

APA Group owns and operates the Moomba to Sydney Pipeline (MSP), an underground natural gas pipeline, from Moomba in South Australia to Sydney in New South Wales. The Moomba to Sydney Pipeline is 1,299km in length and links the Cooper Basin gas fields at Moomba, South Australia, with the Jemena East receiving terminal at Wilton, south west of Sydney, New South Wales. A range of industrial, commercial and residential users in New South Wales and the Australian Capital Territory are serviced by gas delivered by the MSP. The first 111km of the pipeline is located in South Australia (including the 10km Moomba bypass pipeline) and is operated under Pipeline Licence 7, issued by the Department of Primary Industries and Resources, South Australia (PIRSA) in June 1994.

APA Group also operates the underground Ethane Pipeline from Moomba to Sydney, on behalf of the pipeline licensee, Gorodok Pty Ltd. The Ethane Pipeline is 1,375km in length and links the Moomba gas fields with the Qenos Petrochemical Plant in Botany. The first 1299km of the pipeline, including the South Australian section, runs parallel to the MSP, within the MSP easement, at an 8m offset. This pipeline is operated under Pipeline Licence 8, issued by PIRSA in July 1996.

The route of the pipelines is shown in Figure 1.

1.2 About this Document

This Environmental Impact Report (EIR) has been prepared to satisfy the requirements of the *Petroleum and Geothermal Energy Act 2000* with regard to the operation of the South Australian section of the MSP and the Ethane pipeline. This document:

- outlines legislative approvals required for the operations (Section 2)
- provides a description of both pipelines (Section 3)
- describes the specific features of the environment that are reasonably expected to be affected by pipeline operation (Section 4)
- identifies potential environmental impacts and proposes measures to mitigate potential environmental impacts (Section 5)
- describes the proposed environmental management framework for the operations (Section 6)
- outlines stakeholder consultation (Section 7).

A Statement of Environmental Objectives (SEO) has also been developed in conjunction with this EIR. It outlines the environmental objectives that the project is required to achieve and the criteria upon which the objectives are to be assessed. The SEO has been developed on the basis of the information provided in this EIR.

1.3 Project Proponent

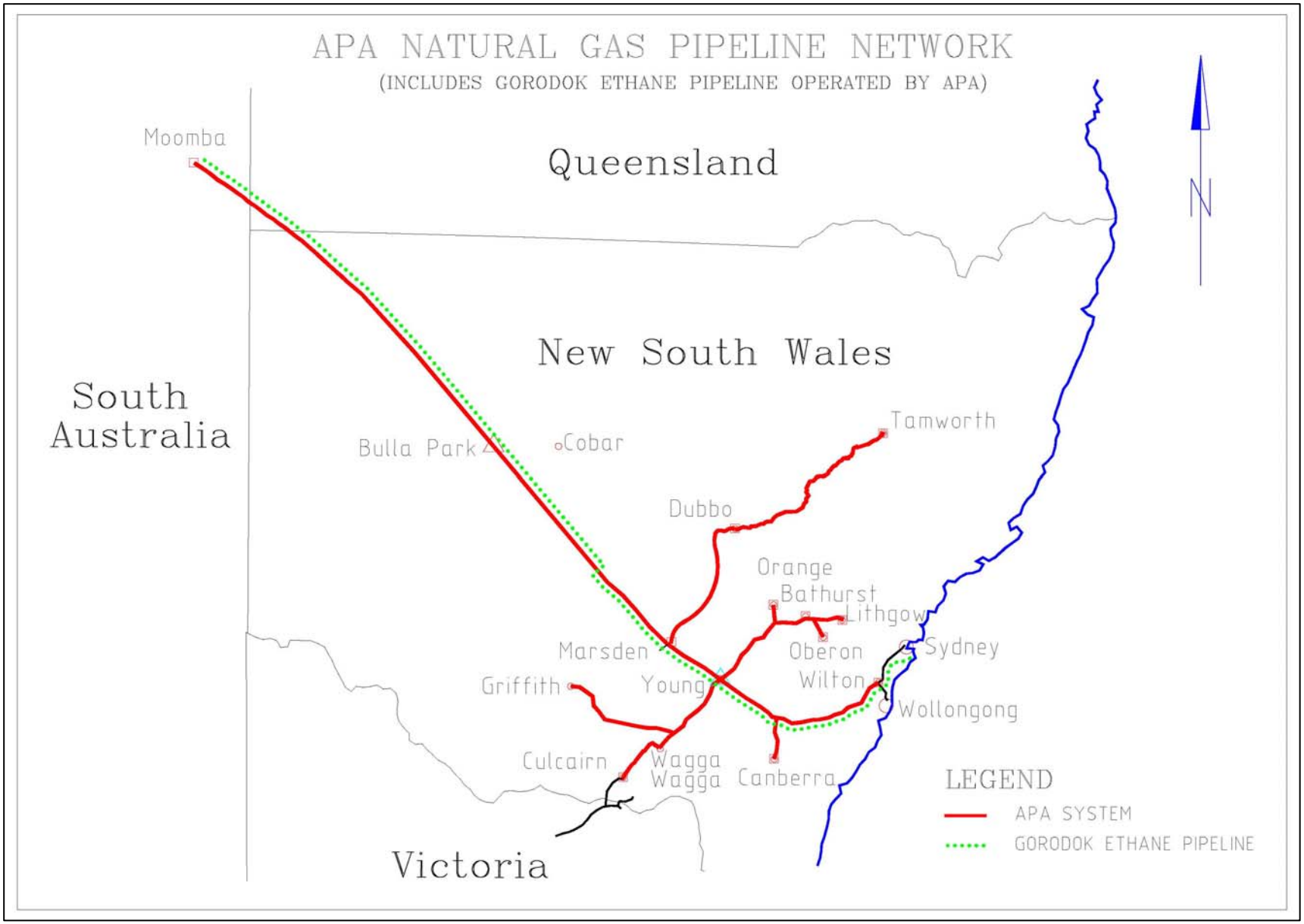
APA Group comprises Australian Pipeline Trust and APT Investment Trust, and is a leading energy transmission business in Australia. APA has interests in more than 10,000 km of natural gas pipeline infrastructure, over 2,300 km of gas distribution networks in south east Queensland, coal seam gas processing plants, gas-fired power stations, gas storage facilities and two high voltage direct current electricity interconnector systems.

1.4 Environmental Commitment

APA Group is committed to responsible environmental management for the operation of the MSP and Ethane pipelines and believes that any potential adverse environmental effects can be effectively managed in a manner that complies with the requirements of this document, as well as:

- all relevant State and Commonwealth laws and regulations
- APA Group's Health, Safety and Environment Policy (see Appendix 1)
- relevant industry standards (e.g. Australian Standard AS2885: Pipelines – Gas and Liquid Petroleum)
- the Australian Pipeline Industry Association (APIA) *Code of Environmental Practice – Onshore Pipelines* (APIA 2005).

Figure 1: Location of Moomba-Sydney Pipeline and Ethane Pipeline in South Australia



2 Legislative Framework

Pipeline operation in South Australia is undertaken pursuant to an approved Pipeline Licence under the South Australian *Petroleum and Geothermal Energy Act 2000*. Operations may also be subject to additional approvals under South Australian and Commonwealth legislation, as discussed in the following sections.

2.1 Petroleum and Geothermal Energy Act

The South Australian *Petroleum and Geothermal Energy Act 2000* (the Act) requires that all regulated activities carried out under the Act must be covered by an approved Statement of Environmental Objectives (SEO). As a consequence this Environmental Impact Report (EIR) and a draft SEO have been prepared to meet this regulatory requirement in relation to the operation of the Moomba to Sydney Pipeline and the Ethane Pipeline.

The requirements are set out in the following sections of the Act and the *Petroleum and Geothermal Energy Regulations 2000* (the Regulations):

- the Environmental Impact Report must be prepared in accordance with
  - Section 97 of the Act, which requires the EIR to take into account cultural, amenity and other values relevant to the assessment, risks to public health and safety of regulated activities, and to contain sufficient information to make an informed assessment of the likely environmental impact of the activities possible.
  - Regulation 10 of the Regulations, which requires the EIR to include descriptions of activities and environmental features which may be affected, assessment of possible affects on cultural values and public health and safety, identification and assessment of consequences of potential environmental hazards, and details of consultation.

- the Statement of Environmental Objectives must be prepared in accordance with sections 99 and 100 of the Act and regulations 12 and 13.

This document fulfils the requirements of an EIR as outlined in the Act and Regulations.

2.2 Other Legislation

A range of other legislation is relevant to the operation of the pipeline, including the legislation outlined in Table 1.

Table 1: Key Additional Legislation

Legislation	Activity	Agency
South Australia		
Natural Resources Management Act 2004	Sourcing water from new bores	Dept of Water Land & Biodiversity Conservation (DWLBC)
Native Vegetation Act 1991	Disturbing or removing native vegetation Note: Vegetation disturbance incidental to the maintenance of infrastructure is exempt under Regulation 5(1)(g)	Native Vegetation Group, Dept of Water Land & Biodiversity Conservation (DWLBC)
National Parks and Wildlife Act 1972	Handling protected fauna	Department for Environment & Heritage (DEH)
Aboriginal Heritage Act 1988	Protects Aboriginal relics, sites and places	Aboriginal Affairs & Reconciliation Division, Dept of Premier & Cabinet
Heritage Places Act 1993	Protects heritage places, relics	DEH
Environment Protection Act 1993	General duty to prevent environmental harm Disposal of water to inland waters	Environment Protection Authority (EPA)

Legislation	Activity	Agency
Commonwealth		
Environment Protection and Biodiversity and Conservation Act 1999	Protects matters of "national environmental significance" including World Heritage properties, National heritage places, Ramsar wetlands of international importance, listed threatened species and ecological communities and migratory species	DEWHA

3 Pipeline Description

3.1 Pipeline Alignment

The MSP was constructed in the 1970s and commissioned in 1976. It is 1,299km in length, linking the Cooper Basin gas fields at Moomba in South Australia with the Jemena East receiving terminal at Wilton, south west of Sydney in New South Wales. In 1984 a 10km bypass pipeline was installed between KP 0 and KP 10. The pipeline runs in a south-easterly direction from the Moomba plant, crosses the Strzelecki Track and then the Strzelecki Creek close to the creek's intersection with the Old Strzelecki Track. It passes through the south-west corner of Innamincka Station before crossing the border into Queensland approximately 101kms from its origin at Moomba.

The Ethane pipeline was constructed in 1995. It is 1,375km in length, linking the Cooper Basin gas fields at Moomba in South Australia with the Qenos Petrochemical Plant in Botany in New South Wales. The first 1299km of the pipeline, including the South Australian section, runs parallel to the MSP, within the MSP easement, at an 8m offset.

3.2 Design and Engineering

Moomba Sydney Pipeline

The South Australian section of the MSP is approximately 101km long. A summary of its design parameters are provided in Table 2.

Table 2: MSP Engineering and Design Features

Design Element	Main Line (PL7)	Bypass Loop (PL7)
Date Constructed	1974-1975	1984
Date Commissioned	1976	1984
Length	1,299 km (101 km in SA)	10 km
Diameter (OD)	860 mm	660 mm
Wall Thickness	8.3 mm	8.74 mm
Coating	Field applied coal tar enamel	FBE
Pipeline Content	Sales quality natural gas	Sales quality natural gas
Operational Pressure	5.2 MPa	5.2 MPa
Maximum Allowable Operating Pressure	5.5 MPa	6.378 MPa
Nominal Capacity	420 TJ/day	
Freeflow Design Capacity	280 TJ /day	
Minimum Depth of Cover	In accordance with AS 2885.1, typically: Cross country sections – 750 mm Beneath roads and watercourses – 1200 mm Heavy industrial location classifications – 1200 mm	
Main Line Valves	5 in SA	nil
Meter Stations	Santos and QSN receipts	nil

A brief description of the pipeline facilities and associated infrastructure is provided in Table 3.

All telemetered stations will utilise 240 volts supplies except where unavailable and solar power with battery back-up is used. All stations will be surrounded by security fencing.

Table 3: MSP Pipeline Facilities and Infrastructure in SA

Facility	Description
Inlet Metering Station	An inlet metering station is located at Moomba to take receipt of gas from the Moomba Plant and deliver into the Moomba to Sydney Pipeline. The meter station includes flow measurement, emergency isolation and pigging facilities.
Mainline Valve (MLV)	5 MLVs installed at approximately every 20-30 km, each fitted with an automatic line break facility to minimise product loss in the event of an uncontrolled gas release. MLVs occupy a fenced and gravelled area of approximately 200 m^2 and are located on the pipeline easement.
Cathodic Protection System	A cathodic protection system is incorporated into the pipeline design to protect the pipeline from corrosion. This involves the use of buried anode beds, which are connected to the pipeline via cabling. In addition, cathodic protection test points are located approximately every 1.6 km. The test points are required to allow for monitoring of the effectiveness of the corrosion protection system.
SCADA System	A SCADA (Supervisory Control and Data Acquisition) system is in place for the remote monitoring and control of shared facilities along the pipeline, comprising of Remote Telemetry Units (RTUs) connected to the APA Groups Young Control Centre (YCC) via Satellite Communication.
Pipeline Markers	Pipeline marker signs are located at intervals along the pipeline easement in accordance with AS 2885, so that a person can clearly see a marker sign in either direction. The maker signs are placed closer at bends, on either side of road and watercourse crossings and at fence lines.

Ethane Pipeline

The South Australian section of the Ethane Pipeline is approximately 101km long. A summary of its design parameters are provided in Table 4.

Table 4: Ethane Pipeline Engineering and Design Features

Design Element	Ethan Pipeline (PL8)
Date Constructed	1995
Date Commissioned	1996
Length	1,375km (101km in SA)
Diameter (OD)	220 mm
Wall Thickness	5.2mm
Factory Coating	Yellow Jacket with shrink sleeves
Pipeline Content	Ethane
Operational Pressure	15.3 MPa
Maximum Allowable Operating Pressure	15.3 MPa
Nominal Capacity	30 tonnes per hour
Minimum Depth of Cover	In accordance with AS 2885.1, typically: Cross country sections – 750 mm Beneath roads and watercourses – 1200 mm Heavy industrial location classifications – 1200 mm
Main Line Valves	2 in SA
Meter Stations	Santos supply only

A brief description of the pipeline facilities and associated infrastructure is provided in Table 5.

Operating in conjunction with the MSP, all telemetered stations will utilise 240 volts supplies except where unavailable and solar power with battery back-up is used. All stations will be surrounded by security fencing.

Table 5: Ethane Pipeline Facilities and Infrastructure in SA

Facility	Description
Inlet Metering Station	An inlet metering station is located at Moomba to take receipt of ethane from the Moomba Plant and deliver into the pipeline. The meter station includes flow measurement, emergency isolation and pigging facilities.
Mainline Valve (MLV)	2 MLV installed at approximately 50km interval, comprised of a single actuated MLV and a bypass which includes a low pressure ALB. MLVs occupy a fenced and gravelled area of approximately 200 m^2 and are located on the pipeline easement.
Cathodic Protection System	A cathodic protection system is incorporated into the pipeline design to protect the pipeline from corrosion. It is cross-bonded to the MSP.
SCADA System	A SCADA (Supervisory Control and Data Acquisition) system is in place for the remote monitoring and control of all facilities along the pipeline, comprising of Remote Telemetry Units (RTUs) connected to the APA Groups Young Control Centre (YCC) via Satellite Communication.
Pipeline Markers	Pipeline marker signs are located at intervals along the pipeline easement in accordance with AS 2885, so that a person can clearly see a marker sign in either direction. The maker signs are placed closer at bends, on either side of road and watercourse crossings and at fence lines.

3.3 Operation

The operation of both pipelines is undertaken by APA Group.

Each pipeline is operated in accordance with approval documentation, an Environmental Management Plan (EMP), AS 2885 and the APIA *Code of Environmental Practice – Onshore Pipelines* (APIA 2005).

A summary of pipeline operational activities, applicable to both pipelines, is provided in Table 6 and discussed below.

A routine operation and maintenance program is in place for the MSP and the Ethane pipeline which includes leak detection, aerial patrols, repair or replacement of faulty equipment, pigging and cleaning of the pipeline, corrosion monitoring and remediation, easement and lease area maintenance. Aerial and/or ground inspections include checking vegetation for discolouration which can be an indicator of a leak, detection of erosion, monitoring of rehabilitation success and detection of weed species.

A light vehicle access track is maintained along the pipeline to allow inspection and maintenance and existing access tracks will be utilised where possible.

The MSP requires ongoing management for stress corrosion cracking (SCC) across the South Australian section, including routine pigging and repair activities. In 2008/9 an extensive repair campaign was carried out as part of a capacity expansion program, which returned the MSP to 5,200 kPa.

All maintenance activities that may be required will be conducted in accordance with the SEO and an EMP. Dig-ups involve the excavation of material from around the pipeline (typically referred to as a bellhole), to allow sufficient room for operations technicians to safely undertake any remedial works that may be required. The excavation of material will be undertaken in accordance with management conditions outlined above for construction (that is, topsoil will be stockpiled separately from trench spoil, and the site will be restored as soon as practical following completion of maintenance works).

Prior to commencing extensive work, or where numerous sites are involved, operations personnel will consult with regulatory authorities as appropriate.

Regular consultation will be maintained with landowners whose properties are traversed by the pipeline. The Dial Before You Dig service is promoted for use by third parties wishing to locate the pipeline prior to undertaking excavations. Operational pipelines generally have very little environmental or landholder impact.

Construction Camps

Temporary construction camps may be required to accommodate maintenance personnel when large-scale maintenance work is undertaken on the pipelines. Camps will be located in clear or disturbed areas and clearance of trees for the camp will be avoided.

The footprint of a camp is dependent upon the size of camp required (i.e. the number of persons to accommodate). Camps will encompass accommodation units, a mess, and recreation huts. Sewage is likely to be treated by a transportable sewage treatment unit (e.g. enviroflow or equivalent - see http://www.enviroflow.com.au).

The water supply for a camp is likely to be obtained from existing sources such as the Moomba RO plant or existing bores. Bore water may require treatment to render it suitable for camp use.

Camp sites may also include an area for equipment and vehicle storage and site office. Equipment stored at the construction depot may include:

- construction vehicles
- diesel fuel and lubricants
- vehicle maintenance equipment
- pipe wrapping and joint coating materials
- pipe.

The sites will be restored to pre-existing condition or better at the completion of construction works. Waste recycling and disposal, spill response and depot maintenance will be carried out in accordance with procedures outlined in Section 5.10.1.

Table 6: Summary of Pipeline Operational Activities

Activity	Description
Easement Maintenance	
Weed Control	Localised control of weeds is undertaken along the easement as required.
Line-of-sight clearance	Clearance of the right-of-way to maintain line-of-sight is generally not required as it is an arid region with predominantly low open grassland or shrubland. Trees retained on the easement during construction will not be removed, however it may be necessary to remove trees that regenerate within approximately 3 m of the pipeline as they pose a threat to pipeline integrity.
Patrolling / inspections - easement access	These are undertaken by travelling along the right-of-way, on private/public roads or over paddocks and will involve access to private property and use of private tracks. Frequency depends on whether particular issue(s) require monitoring; frequency can range from weekly to monthly or longer.
Aerial inspection of easement	Inspections are undertaken using low-flying aircraft and typically carried out every month.
Pipeline Operations	
Cathodic Protection Surveys	Surveys involve travelling the right-of-way and stopping to inspect Cathodic Protection points (above-ground post) on foot. Typically conducted once per year.

Activity	Description
Erosion events	Following major rainfall events creek lines or run-off areas on right-of-way can experience soil erosion. Repairs are effected as soon as practicable following the erosion event and include the replacement of similar materials and re-profiling.
Emissions	Gas is released to the atmosphere as a result of pipeline and facility maintenance operations (i.e. unit blow downs/ venting, valve opening/testing). Small volumes are released. Occurs for duration of operational life
Pipeline Incident	The main threats to public safety from pipeline operation and maintenance are fire, explosion or radiation exposure as a result of pipeline rupture. Pipeline risk assessments have identified that these threats are generally associated with factors such as third party or external interference to the pipeline and pipeline corrosion. Lightning damage, corrosion and SCC are other potential failure modes (leak or rupture).
Pipeline Maintenance	
Pigging	A pipeline 'pig' is placed in the pipe via a launcher trap. The pig travels along inside the pipe before being removed at a pig exit site. Removal of a pig from the pipeline results in minor venting of gas to atmosphere and the collection of some oil sludge and debris. Major MFL (Magnetic Flux Leakage) pigging programs are typically carried out very infrequently (e.g. every 10 to 15 years), whilst SCC pigging is expected to be every 5 years.
Excavations, including coating refurbishment, installation of anode beds, emergency response exercises and new tie-ins	Excavations of the pipeline follow the same processes as those undertaken during pipeline construction, namely clear & grade, trenching, backfill and restoration & rehabilitation but are generally on a much smaller scale. Once vegetation and topsoil have been cleared and stockpiled, the excavation is performed and spoil stockpiled. The pipeline maintenance is then undertaken (this may include welding, painting, sand blasting). Once complete the trench is then backfilled, the ground surface is re-contoured and the topsoil and vegetation respread. Some re-seeding may be undertaken if necessary. These activities are expected to be rare during the life of the pipeline.
Replacement of pipeline section	A section of the pipeline is isolated and a controlled release of gas is undertaken from the affected section. The affected area is then excavated, the old pipeline removed and replaced (includes welding, blasting, coating) and the site reinstated. This is expected to be very rare.
Welding	Welding is usually required when pipeline repairs or modifications are made to existing infrastructure. Pipeline welding usually occurs following the excavation of the pipeline. Pipe spools are welded together. Each weld is inspected using x-ray or ultrasonic equipment as per AS 2885.2-2002.
Coating	Sleeves or tape are expected to be used to coat welds or repair areas of pipeline or above ground pipeline. Epoxy painting (spray) may be used. The area around the weld is wire-brushed or grit blasted and then coated with a protective coating to prevent corrosion.
Pressure Testing	Hydrostatic pressure testing is required when a section of pipe is replaced. During hydrostatic testing the pipeline is capped with test manifolds, filled with water and pressurised up to 100% of specified minimum yield stress (SMYS) for a minimum of four hours. A 24-hour leak test then follows. Fresh water is preferred for hydrotesting, but hydrotest water may be treated prior to testing with chemicals such as biocide, oxygen scavengers and corrosion inhibitors (depending on factors such as the water quality of test water and the length of pipe tested). If hydrotest water meets water quality guidelines and has landholder approval, it is discharged to the surrounding environment. Alternatively, it may be contained and treated on site or removed off site.
Facility Operation and Maintenance	
Metering stations	Metering stations consist of valving, metering ,gas analysis and scraper launching or receiving facilities.
Weed Control	Localised control of weeds is undertaken in and around compounds, typically annually.

Activity	Description
Production of Hazardous Waste	Waste hydrocarbons are generated from maintenance/ pigging operations (ex pipeline/product). Liquids and heavy metals (e.g. mercury) are not expected in the product, but if present they would be trapped in coalescing filters outside of SA.
Waste disposal	General waste generated during operations is collected on site and removed to licensed facilities for disposal.
Venting	Uncontrolled venting which is a result of equipment failure e.g. regulator failure. Duration would depend on type and duration of failure.

3.4 Decommissioning

When the utility is no longer required, the pipeline will be decommissioned in accordance with the regulatory requirements and accepted environmental best practices of the day. Currently decommissioning procedures require the removal of all above ground infrastructure and the restoration of associated disturbed areas.

At the time of decommissioning a decision will be made regarding the opportunities for future use of the pipelines. If no longer required, the pipeline will be purged of gas and below ground facilities allowed to gradually degrade in-situ. The pipeline may be filled with grout or another inert material prior to abandonment where there is a risk of collapse (e.g. large diameter sections). However, if it is considered that the pipeline may offer some future benefits, it will be filled with an inert material and the cathodic protection system maintained to prevent corrosion. All above ground facilities will be removed in any event.

4 Description of the Environment

This section provides an overview of the existing environment along the pipeline in South Australia.

4.1 Climate

The region has an arid climate, with low average rainfall and high evaporation. Seasons are generally characterised by hot dry summers and mild dry winters. Rainfall in the area is highly erratic, with the annual average being about 150 to 200mm. There is no distinct seasonal rainfall pattern and rainfall is often associated with thunderstorm activity and as a consequence can be intense. Evaporation is extremely high, with average annual evaporation ranging from 3000 to 3800mm (Queensland Government 1974, Laut *et al.* 1977).

Temperatures vary from cool in winter to hot in summer, with diurnal variations also being high. In summer, the average maximum and minimum temperatures are approximately 38°C and 23°C respectively, and in winter 20°C and 6.0°C. The maximum recorded temperature is 49.1°C and the minimum -1.4°C (BoM 2007).

A summary of climate records for Moomba (Station 017096; BoM 2007) is provided in Table 7.

Table 7: Temperature and Rainfall Records for Moomba

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean Daily Max (^{o}C)	37.4	36.7	34.0	28.6	23.7	19.9	19.2	22.0	26.0	29.9	33.6	36.7	29.0
Mean Daily Min (^{o}C)	23.3	23.0	19.6	14.8	10.9	7.3	6.3	7.7	11.0	15.0	18.6	21.5	14.9
Mean Rainfall (mm)	40.0	26.4	9.9	13.5	16.2	11.2	16.9	8.6	10.9	18.7	13.4	20.2	206.3
Median Rainfall (mm)	8.9	6.8	2.2	2.1	6.2	6.0	8.3	3.8	2.3	12.9	9.7	4.6	166.4

4.2 Bioregional Environment

The MSP and Ethane pipeline corridor traverses two land systems, as described by the *Marree Soil Conservation Board District Plan* (MSCB 2004), the Cooper land system and the Tingana (formerly Strzelecki) land system. A description of these land systems, as provided in the *Marree Soil Conservation Board District* Plan is provided in the following sections.

4.2.1 Cooper Land System

The first 37 km of the pipeline corridor (KP 0 to KP 37) traverses the floodplains and sand ridges of the Cooper land system. This land system covers an area of 16,724 km² and includes the waterholes, channels, floodplains, ephemeral lakes of the Cooper and Strzelecki Creeks, and the field of parallel sandridges with interdune areas connected to and periodically flooded by them. There are multiple floodplain and lake land units, which can be differentiated on the basis of frequency and intensity of flooding.

Geology, Soils & Landform

Dunes vary from red siliceous sands to whitish siliceous sands - red dunes are older, and may have a clayey core. The larger are equivalent to the dunes of the Strzelecki Land System. Pale dunes are recent deposition from the floodplains, and are more mobile.

Major waterholes are on the main and northwest channels of the Cooper and are post-flooding freshwater pockets with salinity varying both in relation to time since flooding and salt input from saline alluvium or local springs. Soils are pale grey sandy to silty clays.

The braided channels and temporary waterholes on both the Cooper and the Strzelecki have similar soils.

Extended flats of typically pale sandy clays with a veneer of pale grey sands lie behind the braided channels, extending to adjoining pale dunes. The sandy clay layer is hard setting at a depth of about 25 cm forming a hardpan, preventing deeper water penetration. There are also areas of grey self-mulching cracking clay soils with "crabholes" and deeper water penetration. Sandplains are present slightly above the level of the flats. Soils are sandy loams, with a hard setting layer at about 20 cm.

Gilgai flats are generally at a higher level, beyond the low pale dunes and are flooded less frequently. Soils again are pale grey self-mulching cracking clays, with gilgai formation. Large clay interdune corridors also have the same soils.

The land system includes the intermittent lakes of the Coongie Lakes system. Some of these lakes receive a regular flow of water from the northwest branch of the Cooper in average flow years, but can dry out almost entirely in extended drought periods. Soils again are grey clays, with sediment deposited on lake floors.

The pipeline corridor crosses the Strzelecki Creek at KP 34.

Flora

Larger red dunes support a low woodland or tall shrubland of whitewood (*Atalaya hemiglauca*), narrow-leaf hopbush (*Dodonaea viscosa* ssp. *angustissima*), needlewood (*Hakea leucoptera*) and sandhill wattle (*Acacia ligulata*) over kerosene and mulga grasses (*Aristida* spp.), buckbush (*Salsola kali*) and grey copperburr (*Sclerolaena diacantha*). The majority of the red dunes in the area have crests and upper slopes carrying sandhill canegrass (*Zygochloa paradoxa*) and ephemeral species. Lobed spinifex (*Triodia basedowii*) may be present.

The more mobile pale dunes have perennial cover which may be sandhill wattle, eurah (*Eremophila bignoniiflora*) and occasionally Coolibah (*Eucalyptus coolabah*), with a hummock grassland cover of lobed spinifex, and ephemeral species.

Major waterholes are on the main and north-west channels of the Cooper Creek and support tall woodland including river red gum (*Eucalyptus camaldulensis*) and coolibah, with eurah, bean tree (*Lysiphyllum gilvum*), Broughton willow wattle (*Acacia salicina*) whitewood and native orange (C*apparis mitchellii*). There is usually an understorey of lignum (*Muehlenbeckia florulenta*), with groundcover of short-lived perennials or annuals: cannonball, tangled poverty bush, ruby saltbush (*Enchylaena tomentosa)* and annual saltbushes.

The braided channels and temporary waterholes on both the Cooper and the Strzelecki have similar soils and vegetation. The overstorey is primarily coolibah with occasional river red gum and cooba (*Acacia stenophylla*). Lignum stands are dense, growing on pale grey self-mulching cracking clays. This is also the vegetation of the named "swamps" of the land system, e.g. Tirrawarra swamp.

Coolibah, with whitewood and spotted emubush (*Eremophila maculata* var. *maculata*) on sandier patches, forms woodland to open woodland. There is a shrub layer of old man saltbush (*Atriplex nummularia*), Queensland bluebush (*Chenopodium auricomum*) and lignum, the first and sometimes the second also absent in areas hard-hit by 19th and early-20th century stocking. Subshrubs include red and other copperburrs and poverty bushes (*Sclerolaena* spp.). Annuals include buckbush and the exotic onionweed (*Asphodelus fistulosus*).

Gilgai flats, at a higher level than the preceding and generally beyond the low pale dunes bordering the coolibah woodlands, are flooded less frequently and hence lack the tree cover. Chenopod shrubland of Queensland bluebush dominates, but variations depend on frequency of flooding. Swamp canegrass (*Eragrostis australasica*) or lignum may appear as single species stands or, mixed with each other and the Queensland bluebush.

Large clay interdune corridors also have the same soils and species, with additional copperburrs (*Sclerolaena* spp.) in the groundcover. Responses to rain, particularly in clay swales, may be prolific, with buttongrass (*Dactyloctenium radulans*), New Zealand spinach (*Tetragonia* sp.), buckbush and pigweed (*Portulaca* sp.) common.

Sandplains (that are present slightly above the level of the coolibah flats) carry a low open woodland including whitewood, prickly wattle (*Acacia victoriae*), sandhill wattle, some coolibah, needlewood (*Hakea leucoptera*) and beefwood (*Grevillea striata*) over a mixed grass and subshrub groundcover: mulga grass (*Aristida contorta*), oatgrass, katoora (*Sporobolus actinocladus*), mulka (*Eragrostis dielsii* var. *dielsii*) with buckbush, goathead burr (*Sclerolaena bicornis* var. *bicornis*), tangled lechenaultia (*Lechenaultia divaricata*) and copperburrs.

Significant Fauna

One nationally threatened fauna species has been predicted as occurring in the land system (DEWHA 2008) and three state listed fauna species has been recorded close to the pipeline corridor (DEH 2009). Details on the occurrence of these species are provided in Table 8. A full list of rare or threatened species recorded in the Biological Databases of South Australia within 20 km of the pipeline corridor is provided in Appendix 2.

Common fauna in this land system include birds such as Australian Magpie, Galah, Brown Falcon, Budgerigar, Black-faced Woodswallow and Little Corella, small mammal species such as Fat-tailed and Stripe-faced Dunnarts, Giles Planigale, Sandy Inland Mouse and the introduced House Mouse, reptiles such as Fat-tailed Gecko, Sand Goanna, Painted Dragon, Eastern Brown Snake, Curl Snake and Inland Taipan and amphibians including Trilling Frog and Green Tree Frog (in areas close to permanent water). The floodplains of the Cooper land system also support a range of waterbirds when inundated.

Table 8: Listed Species Recorded Within Cooper Region

Species	Conservation Status		Comment
	SA	C'wealth	
Australian Painted Snipe (*Rostratula australis*)	Rare	Vulnerable	The EPBC Act database predicts the presence of this species but the possibility that it may be present is considered negligible. There are no database records for *R. australis* in the SA Cooper Basin. It is a wetland species and has been recorded in other areas as occurring in infrequently filled freshwater wetlands, predominantly August to March.
Black-breasted Buzzard (*Hamirostra melanosternon*)	Rare	-	The closest database records for this species are within 10 km of the pipeline along the Strzelecki Creek, which acts as a focus for raptors. Widely foraging species. Inhabits open woodlands, floodplains, avoids forests and other dense vegetation. Feeds on lizards, mammals, nesting birds and eggs
Woma (*Aspidites ramsayi*)	Rare	-	Database records at Moomba and to the south of Moomba along Strzelecki Track. Large python (up to 230 cm) which inhabits dunefields and sandy plains in arid areas of central Australia.
Grey Falcon (*Falco hypoleucos*)	Rare	-	Database record (skeleton) near Moomba. Resident or nomad on tree-scattered plains or along desert watercourses, mainly in the interior.

4.2.2 Tingana (Strzelecki) Land System

Between KP 37 and the SA-Qld border (KP 101) the pipeline corridor traverses dunefields which are part of the Tingana (formerly Strzelecki) land system, extending from east of Lake Blanche to Innamincka, with a tongue extending north of the Cooper Creek into Sturt's Stony Desert. This large land system (43,161 km^2 total area) contains long parallel sandridges with semi-mobile crests, with sandy and clayey interdunes and numerous claypans and internal soakages.

Geology, Soils & Landform

Strzelecki land system dunes are deep red siliceous sands with semi-mobile crests and relatively stable slopes. Lower slopes and narrower interdunes are clayey sands to red sandy clay loams. Narrower (<300 m) interdunes are characteristically massive (non-cracking) red sandy clay loam, usually with a shallow veneer of loamy sand to a maximum of 20 cm depth. Wider interdunes, up to 1 km between crests, have red self-mulching cracking clay soils with frequent areas of claypan and non-cracking massive red earths.

Within the Strzelecki land system, claypan swamps may be present in any interdune but are largest and most frequent in the wider interdunes. Although their soils and vegetation resemble those of Cooper and Strzelecki Creek floodplains, drainage is internal to the particular interdune and has no connection to flood flows. Margins of swamps have massive red earths with little vegetation, with brown or grey cracking self-mulching clays in lower parts of the swamp. Claypan swamps diminish in size and importance to the south. While claypans remain frequent, the development of the productive grey cracking clays of swamp centres is limited. Also, the Queensland bluebush component of swamp vegetation disappears, with swamp canegrass becoming more important.

Low limestone or kopi rises are present in some interdunes as a minor component. Surface soils remain sandy loams, becoming calcareous at depth.

Flora

Typical vegetation in the Strzelecki land system is outlined in *Marree Soil Conservation Board District Plan* (MSCB 2004) and summarised below.

Dune upper and mid-slopes support a low woodland or tall shrubland of whitewood (*Atalaya hemiglauca*), narrow-leaf hopbush (*Dodonaea viscosa* ssp. *angustissima*), needlewood (*Hakea leucoptera*) and sandhill wattle (*Acacia ligulata*) in the north. Whitewood becomes infrequent in the south. There is a mid-storey of lobed spinifex (*Triodia basedowii*) and thorny saltbush (*Rhagodia spinescens*) or sandhill canegrass (*Zygochloa paradoxa*) where crests are semi-mobile, and a groundcover of ephemerals and short-lived perennials particularly kerosene and mulga grasses (*Aristida* spp.), buckbush (*Salsola kali*) and grey copperburr (*Sclerolaena diacantha*).

In narrow interdunes and on lower dune slopes, tree cover diminishes but species composition remains similar.

Apart from occasional groves of very low senna (*Senna artemisioides*) or needlewood, wide interdunes are treeless. Cover is perennial grass and short-lived perennial copperburrs and similar: curly Mitchell grass (*Astrebla lappacea*), neverfail (*Eragrostris* spp.), mulka (*Eragrostris dielsii*), copperburrs and poverty bushes (*Sclerolaena* spp.).

The grey clays, at the terminus of drainage, support shrubland of lignum (*Muehlenbeckia florulenta*), Queensland bluebush (*Chenopodium auricomum*) and swamp canegrass (*Eragrostris australasica*), either mixed or in single-species stands, with perennial grasses neverfail and mulka. Following water run-on, ephemeral growth includes tall copperburr (*Sclerolaena convexula*), common joyweed (*Alternanthera nodiflora*), bogan flea (*Calotis hispidula*) and pop saltbush (*Atriplex spongiosa*).

On the low limestone or kopi rises trees are absent, and the main cover is low shrubland of low bluebush or cottonbush (*Maireana* spp.), with grey copperburr, buckbush, pale poverty bush (*Sclerolaena divaricata*), goathead burr (*Sclerolaena bicornis* var. *bicornis*), neverfail and annual grasses. Bladder saltbush (*Atriplex vesicaria*) appears to the south.

Significant Fauna

One nationally threatened fauna species has been identified as present in the region, the Dusky Hopping-mouse (*Notomys fuscus*). As indicated in Table 9 this species has been recorded as occurring on the pipeline corridor within the Tingana land system (DEH 2009). Although not previously recorded in the vicinity of the pipeline, the Woma (*Aspidites ramsayi*) is also likely to occur in this land

system (see Table 8). A full list of rare or threatened species recorded in the Biological Databases of South Australia within 20 km of the pipeline corridor is provided in Appendix 2.

The common fauna species present in this land system are similar to those described for the Cooper land system above. Bird diversity is generally lower due to the absence of riparian woodland habitat, and sand dune specialist species (e.g. Sandy Inland Mouse) become more common.

Table 9: Listed Species Recorded Within Tingana Land System

Species	Conservation Status		Comment
	SA	C'wealth	
Dusky Hopping-mouse, Wilkiniti (*Notomys fuscus*)	Vulnerable	Vulnerable	Present within region. 2 database records on the pipeline easement at KP37 and KP64 near Strzelecki Creek and the border. Numerous other sightings have been recorded on dunes along the Strzelecki Track[1]. Believed to be widespread but sparsely distributed throughout the region. *N. fuscus* inhabits sand dunes and areas of deep sand, but has not been recorded on swales with clayey or hard soils[1]. The presence of perennial vegetation is also considered and important habitat feature (Moseby *et al* 1999).

4.3 Heritage

The location of known aboriginal heritage sites located along the pipeline corridor in South Australia is documented in the operations GIS.

The pipeline corridor traverses a short section of the Strzelecki Creek National Heritage Place between KP 32 and KP 36. This site is listed on the Register of the National Estate as an indicative historical heritage site (ID No. 105141).

4.4 Land Use

Pastoralism

The most extensive form of land use in the region is pastoralism, mainly in the form of cattle grazing, which began in the region in the late 1800s and has continued despite dramatic seasonal and economic fluctuations. The plains and dunefields are utilised for pasture but this use is dependent on the use of bores to supply water and these areas can generally only support stock on an opportunistic basis after rain. Stocking rates in the region are relatively low.

Pastoral leases intercepted by the pipeline corridor are:

- Gidgealpa (KP0 – KP57)
- Innamincka Station (KP 57 – KP60)
- Merty Merty (KP 60 – KP 76)
- Bollards Lagoon (KP 76 – KP 101).

There are a number of properties in the region that have achieved certification by the National Association for Sustainable Agriculture Australia (NASAA) for organic beef production. The pipelines cross Bollards Lagoon and Merty Merty stations which have either obtained a level of certification or are in the process of conversion to NASAA Organic Beef Exporters (OBE). The OBE guidelines identify the maximum levels of chemicals allowable in soil, consistent with allowing organic certification for beef exports.

[1] Pers. comm. R. Brandle, Biological Survey and Research, Department for Environment and Heritage.

All landholders along the pipelines are certified under the Cattle Care Quality Assurance system. Cattle Care is an initiative of the Cattle Council of Australia and places emphasis on minimising the risk of chemical contamination, bruising and hide damage and ensuring that herds are effectively managed and improved. In particular, the contamination of property and livestock by organochlorines and other persistent chemicals must be minimised, and contaminated cattle identified. Prevention of bruising and hide damage puts the onus on landholders to manage the property carefully and reduce the risk of damage from foreign bodies.

Oil and Gas Exploration and Production

Oil and gas exploration in the Cooper Basin commenced in 1954 and the Cooper Basin has become a major supplier of oil and gas in Australia since the discovery of gas reserves at Gidgealpa, near Moomba, in 1963.

Significant oil and gas infrastructure in the region includes:

- the Santos operated oil and gas production plants at Moomba
- Several large transmission pipelines (Moomba Adelaide Pipeline, Ballera Moomba pipelines)
- Big Lake oil and gas field
- Toolachee Gas, Strzelecki Oil/Gas and Limestone Creek Oil fields.

The pipeline corridor passes through a number of petroleum production and exploration licence areas. Numerous oil wells and gathering lines are located throughout the region, and drilling of new oil, gas and geothermal wells is ongoing.

Conservation

The pipeline corridor transects the south-east corner of Innamincka Station (approx 3km) but is outside the boundary of the Innamincka Regional Reserve (IRR). The IRR is a multiple use reserve, with the regional reserve category designed to enable areas to be managed under a conservation framework while permitting the sustainable use of resources (i.e. oil and gas production and grazing). There are a number of sites within the Innamincka Regional Reserve that are listed on the State Heritage Register or Register of the National Estate.

The pipeline corridor also traverses the Strzelecki Creek wetland system, which is listed in the Directory of Important Wetlands in Australia (Environment Australia 2001). This system is predominantly dry and flows very intermittently from Cooper Creek south to Lake Blanche during large Cooper floods (Strzelecki Creek flows are thought to occur with an average frequency of 1 in 10 years; Puckridge *et al.* 1999). When flooded, it provides significant habitat for large numbers of waterbirds.

Infrastructure

The pipeline corridor crosses a number of unsealed public roads, station tracks and Santos access roads. These roads and tracks are used for access to the pipeline corridor by vehicles associated with pipeline operations activities. The main public road crossings on the pipeline corridor are listed in Table 10.

Table 10: Public Road Crossings on the Pipeline Corridor

Road Name	Location	KP
New Strzelecki Track	Section of track between Lyndhurst and the Moomba-Dullingari Road (Dillon's Highway) intersection	2.5
Old Strzelecki Track	Lyndhurst to Innamincka to via Merty Merty homestead and the Cooper Creek floodplain	34.0

The major road in the region is the Strzelecki Track. This is a multiple use road which carries a relatively high traffic volume, being predominantly a mix of heavy vehicles, light industrial/pastoral vehicles and tourist vehicles. The Strzelecki Track has been estimated to carry approximately 31,000 vehicles every year (DTEI 2007).

There is a significant optic fibre telecommunications cable which parallels the pipeline corridor.

A limited number of power lines are present in the vicinity of some petroleum wells and the vicinity of the Moomba plant.

4.5 Noise

The existing noise environment in the region is typical of sparsely populated pastoral areas, with generally low levels of background noise dominated by natural sources (e.g. wind, animals and insects) although those sections of the pipeline corridor in close proximity to oil and gas production facilities are an exception. Intermittent background noise from diesel power generators is present near inhabited station dwellings.

The region is extremely sparsely populated and there are no residences near the pipeline corridor.

4.6 Air Quality

The air quality in the vicinity of the pipeline route is expected to be typical of a remote rural environment and influenced by a range of activities such as:

- dust from stock and vehicle movements or high winds
- vehicle and equipment exhaust fumes.

Air quality near existing operations (e.g. Moomba) is expected to be marginally influenced by emissions from these operations.

5 Potential Impacts and Mitigation Measures

This section identifies the potential impacts to the environment as a result of pipeline operation and outlines proposed impact mitigation strategies. The implementation of these mitigation strategies is detailed in the Pipeline Licence 7 Environmental Management Plan (APT/EAPL 2006) and will be consistent with the APIA *Code of Environmental Practice – Onshore Pipelines* (APIA 2005).

5.1 Soils and Terrain

5.1.1 Potential Impacts

Pipeline operation and maintenance activities that have the potential to impact on soils include:

- excavation activities ('dig-ups') undertaken to expose a section of pipe requiring repair or replacement. Excavations are generally performed for corrosion or stress corrosion cracking (SCC) repair activities, coating refurbishment work, installation of new anode beds and projects requiring new tie in facilities. Excavations usually occur on the pipeline easement or in designated compounds and are a short term, temporary event.
- movement of vehicles along the pipeline corridor and associated access tracks. Vehicles regularly travel along access tracks and the pipeline easement while undertaking inspection and maintenance activities. Theses unsealed tracks are predominantly located on station properties where public access is restricted.
- storage, use, collection and transport of hydrocarbons and chemicals. A variety of hydrocarbons and chemicals are used for maintenance activities (e.g. diesel fuel, lubricants for machinery, degreasing agents, paints, etc.). Waste hydrocarbons are also generated via the collection and removal of product contaminants in the pipeline (via filters or 'pigging' operations) and maintenance activities on machinery and vehicles. All waste hydrocarbons are collected and removed for disposal at a licensed waste facility. All maintenance and collection activities are undertaken in accordance with APA procedures which include spill prevention measures.

Operation and maintenance of the pipeline may result in the following potential adverse effects to soil and terrain:

- Soil inversion and resulting loss in soil fertility or structure
- Erosion of disturbed sandy soils and the fine powdery sub-soils, particularly by wind
- Erosion of banks and channels of watercourses
- Compaction of soils
- Contamination of soils by oil or chemicals.

It is considered that these impacts can be appropriately managed through the implementation of the mitigation measures outlined below.

5.1.2 Impact Mitigation

Measures to reduce the risk and impact of soil erosion include:

- minimising the area cleared during excavations, in particular minimising the disturbance of erodible soils
- minimising the time period between clearing and restoration
- keeping topsoil stockpiled separate from subsoils and respreading after backfilling in the immediate vicinity of its origin
- promoting rapid restoration by conserving and re-spreading topsoil
- reinstating surface contours and natural drainage patterns
- reinstating watercourse banks as soon as practicable and applying bank stabilisation techniques as necessary
- restricting the use of heavy machinery to the minimum necessary to complete the task
- restricting vehicle use in wet or boggy conditions
- monitoring for erosion, evidence of inversion and compaction
- managing all oils, chemicals and wastes in a manner that minimises the risk of spills to the environment and having in place appropriate contingency plans in the event of a spill.

5.2 Water Resources

5.2.1 Potential Impacts

Pipeline watercourse crossings generally have minimal impact on the dynamics of a watercourse as the pipeline is buried at depth. Vehicle access at watercourse crossings is generally restricted to 4WD tracks and dry conditions.

Pipeline operation activities that may have the potential to impact upon surface water resources include the movement of vehicles and the transport of materials along access tracks and the pipeline easement and temporary excavation activities.

Pipeline operation may result in potential impacts to surface water including:

- disturbance of surface water drainage patterns along watercourses and floodplains
- reduced water quality associated with low level contamination.

It is considered that these impacts are minimal in terms of severity and duration, and can be appropriately managed through the implementation of the mitigation measures outlined below.

The only pipeline operations likely to have a potential impact on groundwater are those involving the use of hydrocarbons or chemicals where there is the potential for an uncontrolled spill.

5.2.2 Impact Mitigation

Mitigation of impacts on surface water largely relates to the protection of drainage patterns and preventing contamination. Mitigation methods include:

- ensuring excavation activities (including stockpiles) do not unduly impede surface water flows
- conducting maintenance activities across drainage lines when dry, where practicable
- utilising sediment control measures
- reinstating surface contours as part of the rehabilitation process
- disposing of hydrotest waters appropriately
- reducing the level of activity during wet weather
- ensuring all vehicles are well maintained and that all servicing occurs at designated facilities
- adopting appropriate chemical and oil storage, handling and disposal.

5.3 Flora and Fauna

5.3.1 Potential Impacts

Flora

Daily pipeline operation activities have little impact on native vegetation, however irregular or unscheduled maintenance activities have the potential to result in the clearance of trees, shrubs and groundcover. The movement of vehicles along the easement and welding operations also have the potential to result in fire.

Activities which may adversely impact on flora include:

- excavation activities ('dig-ups') undertaken to expose a section of pipe requiring repair or replacement. Excavations usually occur on the pipeline easement in designated compounds and are a short term, temporary event. Vegetation is removed from the immediate area of excavation, which may extend for 5-10m along the easement and from storage and stockpile areas if required.
- vegetation control. Trees are not permitted to grow on the easement within approximately 3m of the pipeline centreline. Other vegetation on the easement is controlled to ensure that the line of sight for pipeline markers is maintained. Vegetation is generally removed via slashing, with vegetation left just above ground level (150mm-300mm) to ensure roots and ground covers are left in place and that bare earth is not exposed.

The loss of vegetation as a result of these activities is likely to be short-term and restricted to the existing easements that have previously been used for pipeline construction and maintenance activities.

The removal of vegetation as a result of excavation activities is mitigated by reinstatement and, where required, rehabilitation activities undertaken as part of the excavation reinstatement process. Reinstatement activities are undertaken following the completion of excavation or disturbance activities; however the degree of success is highly dependant upon seasonal conditions and rainfall events and other external factors such as land use and grazing. Consequently revegetation may take several years.

Targeted weed control may also be undertaken in compounds or on the easement if excessive weed growth is observed during routine surveillance activities. The potential for pipeline operations to spread weed species is discussed in Section 5.4.

Fauna

Daily pipeline operation and maintenance activities have little impact on fauna, however irregular or unscheduled maintenance activities, such as excavations, have the potential to result in the loss of foraging and breeding habitat. The impact of such disturbances is likely to be short-term and restricted to existing easements that have previously been used for pipeline construction activities. There is also the potential for entrapment of fauna at excavation sites, although the duration of excavation work is generally limited to three days (may be longer for major repair work).

Other potential impacts to fauna as a result of the operation of the pipeline and associated facilities include:

- fauna mortality, through incidental roadkills or occasional contact with facilities
- short-term disturbance associated with noise, vehicle traffic and human activity on the easement and at facilities (especially relevant times, such as breeding, when fauna are sensitive to disturbance).

The pipeline also traverses pastoral land used for the grazing of livestock. The daily operation of the pipeline has little impact upon livestock.

5.3.2 Mitigation Measures

General management strategies that are implemented to minimise the impacts on flora and fauna are provided below.

Impact mitigation measures include:

- restricting operational activities to access tracks and the easement
- minimising the time between clearing and rehabilitating the easement when excavations are required
- trimming vegetation rather than clearing, particularly at watercourses
- where practical, removing vegetation without disturbing the soil to preserve root and seed-stock along the easement
- planning excavations to ensure that the period of time that the trench is open is minimised
- provision of fauna escape means in open trenches and regular inspection of open trenches for trapped fauna. Additional fauna protection measures (e.g. sawdust-filled hessian sacks soaked in water) may be installed where appropriate (e.g. where there are long sections of trench open in hot weather)
- keeping topsoil stockpiled separate from subsoils and respreading after backfilling in the immediate vicinity of its origin
- respreading of cleared vegetation where it does not impede vehicles, stock or wildlife
- re-contouring the land surface consistent with the surrounding area to ensure localised habitats/niches are maintained.

Control measures are in place regarding the restriction of potential ignition sources and welding activities and the likelihood of a fire resulting from these activities is considered remote.

5.4 Weeds & Diseases

5.4.1 Potential Impacts

The movement of maintenance vehicles and equipment along the easement has the potential to result in the spread of weed species through the transport of plant material or soil on vehicles.

Few declared or non-declared environmental weed species are present in the region. One weed of particular note is Buffel Grass (*Cenchrus ciliaris*) which, although not declared under the *Natural Resources Management Act 2004*, has been identified as a concern in regard to long term impacts to biodiversity (Greenfield 2007). There are no BDBSA records of this species on the pipeline corridor, but it has been recorded near Moomba. The bioregions that the pipeline corridor traverses (Channel Country and Simpson Strzelecki Dunefields) have been identified as a protection and management zone for Buffel Grass in the *2007 SA Arid Lands Buffel Grass Management Plan Draft* (Greenfield 2007).

5.4.2 Mitigation Measures

Measures to reduce the risk of pest and/or disease spread include:

- identifying and clearly marking known infestations of weeds along the easement
- developing and implementing procedures to define access routes to the easement, and where necessary avoiding areas of known infestation
- minimising soil transport along the easement and prevention of soil transport out of areas of known weed infestation
- where access to areas infested by weeds is required, washing vehicles and equipment down thoroughly (i.e. prior to accessing to weed free areas)
- ensuring that excavating machinery and other equipment is received on-site free of a build-up of soil and organic matter. Equipment is to be inspected prior to unloading at site
- where required, implementation of targeted weed eradication programs.

5.5 Land Use

5.5.1 Potential Impacts

The operation of the pipeline has only a minor localised impact on land use. Localised impacts can be summarised as follows:

- Occasional short-term reduction in available pastoral grazing land during excavations
- Use of access tracks on pastoral properties to access the easement.

The impact of minor spills on ‘chemical free’ or ‘organic’ properties has also been considered. While the potential for such incidents is considered low, mitigation measures will be undertaken to avoid a breach of conditions associated with the property status. This would include isolation of the spill area and restoration of the area in close liaison with the relevant landholder.

The impact of soil inversion has also been considered however procedures are in place concerning the stockpiling of soil and fill during excavations and the return of the original soil profile during re-instatement activities.

Impacts to conservation values are associated with the potential disturbance to flora, fauna or items of cultural heritage. Generally, as the impact will be contained to the existing, previously disturbed easement, it is expected that there will be minimal disturbance to existing land uses as a result of pipeline operations.

No impacts are expected to the petroleum industry outside the assets and operations of APA.

5.5.2 Impact Mitigation

Measures implemented to mitigate impacts on land use include:

- minimising the extent of disturbance to vegetation and restricting activities to the immediate easement as far as possible
- notification of landholders on 'chemical free' or 'organic' properties of any spills and obtaining permission prior to the use of chemicals on site
- planning activities to minimise the time between clearing of vegetation and rehabilitation
- reinstating all fences cut during maintenance activities, following rehabilitation of the easement and ensuring temporary arrangements are determined in consultation with the relevant property manager. Any damage to pastoral property infrastructure is be rectified
- ensuring property gates are left as found.

5.6 Heritage

5.6.1 Potential Impacts

Potential impacts to cultural sites are likely to be minimal as all operational activities are located within existing easements. However, potential impacts may occur as a result of excavation activities where they result in the accidental discovery of new materials.

The discovery of new sites or identification of cultural material is most likely to occur during excavation activities and may, in the northern regions of the state, yield sub-surface remains, including human remains.

5.6.2 Mitigation Measures

Measures implemented to mitigate impacts on heritage sites include:

- completion of an archaeological survey to identify all significant areas prior to the commencement of significant excavation activities in previously un-surveyed areas
- entry of all known sites into pipeline GIS system and inclusion in all planning documents and maps
- fencing, flagging and recording of new sites with a GPS and inclusion of sites on the GIS system. Development of further management measures are adopted in consultation with community representatives.

5.7 Noise

5.7.1 Potential Impacts

The normal operation of the pipeline is silent along the pipeline corridor and will not generally involve significant noise impact. Any noise emissions associated with the operation of the pipeline include vehicle movement along the easement, the occasional operation of heavy equipment or machinery such as excavators, graders and bulldozers, and the operation of mainline valves. Some low-level noise is generated at the metering station at Moomba, however given the industrial location of this site the noise is insignificant compared to background noise.

Noise associated with mainline valves is generated during remote valve operation but these operations only occur on an occasional basis. In an emergency, high pressure gas venting may occur at valve sites or at the site of a pipeline rupture. The duration of the venting and the volume of gas vented would be dependent upon the nature of the emergency.

There is no noise associated with normal operation of the gas pipeline.

5.7.2 Impact Mitigation

Equipment is maintained in good condition with standard noise suppression devices fitted. It is considered that specific noise mitigation measures are not required.

5.8 Air Quality

5.8.1 Potential Impacts

Dust is likely to pose the main threat to existing air quality. However, the impact of dust on air quality, vegetation (dusting), land use (air quality) and public safety (visual impairment, air quality) is likely to be localised, short term and restricted to vehicle movement on unsealed roads, occasional excavation, and road maintenance activities. Dry conditions are likely to increase dust generation.

The impact on air quality during pipeline operations is negligible. Dust generation from light vehicles and activities associated with the maintenance and monitoring of the pipeline does occur. Minor emissions from the pipeline are likely at above-ground facilities during maintenance operations. Remote operation of valves (in the event of damage or programmed maintenance) uses gas pressure to drive valve actuators and will result in the release of small amounts of gas. Minor emissions from scraper stations will occur during loading and removal of the pipeline pigs, which would normally occur once every five to ten years.

Fugitive emissions are extremely low from pipeline operations. The risk of pipeline ruptures or leaks is also extremely low due to the implementation of protection measures and the routine monitoring, inspection and maintenance that will be carried out.

Given the isolated nature of potential emission generation, impacts on air quality associated with the pipeline are expected to be low.

5.8.2 Impact Mitigation

Dust emissions will be mitigated by minimising the period between clearing and restoration, and limiting vehicle speeds on access tracks and the easement.

Planned releases of gas (e.g. for testing of valves or equipment) are planned for when meteorological conditions are favourable. Other air emissions will be mitigated by employing adequate pollution control measures on plant and equipment.

5.9 Third-party Infrastructure

5.9.1 Potential Impacts

Impacts to third party infrastructure can be mitigated through planning and appropriate consultation with relevant stakeholders and landholders. With adequate management the following impacts can be prevented:

- disruption or damage to road infrastructure
- disruption or damage to petroleum infrastructure
- disruption or damage to private third party property.

Inspections of the easement are periodically required during pipeline operations. The majority of the inspections are undertaken by air, however, some inspections are undertaken by four wheel drive vehicles. Impacts to roads or traffic conditions are considered negligible.

Impacts to private property infrastructure may include cutting fences and installing temporary gates, and modifications to existing gates or tracks. Damage will be avoided where practicable and made good upon activity completion if unavoidable.

5.9.2 Impact Mitigation

Measures implemented to mitigate impacts on transport networks, utilities and private infrastructure include:

- addressing any damage caused to roads and tracks
- maintaining close liaison with Santos and other utility managers to identify existing overhead and buried cables, lines and pipes

- obtain standard clearance for service crossings from utility managers
- maintaining close liaison with landholders.

5.10 Waste Management

Relatively small amounts of domestic and industrial wastes are generated during the operation of pipelines.

Measures adopted for waste management include:

- Development of 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
- Education of personnel on the required waste management practices
- covering of bins to prevent access by fauna and the spread of rubbish by wind
- management of hazardous wastes, such as solvents, rust proofing agents and primer, in accordance with the requirements of relevant legislation and industry standards
- appropriate implementation of sewage waste treatment and disposal practices in accordance with the *Public and Environmental Health (Waste Control) Regulations 1995.* The method of disposal for wastewater must comply with the *Standard for the Construction, Installation and Operation of Septic Tank Systems in SA*, or be to the satisfaction of the Department of Health.
- obtaining relevant approvals for the disposal of hydrotest water
- placing a high emphasis on housekeeping and ensuring that all work areas are maintained in a neat and orderly manner
- collecting hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations
- storage and handling chemicals in accordance with relevant legislation and standards
- remove all waste material from worksites on completion of maintenance activities.

5.10.1 Hazardous Storage, Spill and Emergency Response

A variety of chemicals may be required pipeline maintenance activities. 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.

Measures implemented to reduce the effects of hazardous substances and spill events to the environment and third parties include:

- secure storage and handling of hazardous material to ensure they cannot drain onto the ground or to watercourses or floodplains
- appropriate storage (e.g. bunding as per regulatory guidelines) of all fuels and hazardous materials
- ensuring materials and equipment required to respond to a hazardous spill are readily available
- enforcement of procedures for emergency response
- appropriate implementation of cleanup/spill response procedures if the event of a spill
- maintenance of Material Safety Data Sheets
- appropriate training of operations personnel.

5.11 Public Safety and Risk

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

5.11.1 Potential Impacts

The main threats to public safety resulting from the operation and maintenance of the pipeline are fire, explosion or radiation exposure as a result of pipeline rupture. The main causes of such ruptures are considered to be:

- External corrosion
- Overpressure
- Material defects

- Design defects
- Construction defects
- Direct impact from a vehicle or heavy machinery
- Installation of electricity poles or other services
- Maintenance of roads and drainage ditches.

The Cobar SAOP lists a wider range of integrity threats.

The greatest threats to the integrity of the MSP and the Ethane pipeline are associated with :

- Third Party or External Interference to the pipeline – e.g. excavation, trenching operations, hole boring, core sampling and bore drilling and failure of other pipelines (rupture)
- Pipeline Corrosion especially SCC on the MSP.

5.11.2 Mitigation Measures

There are a number of features of the design and operation philosophy that mitigate the risk posed by the pipeline to people who may be living, working or travelling in the immediate area.

The MSP and the Ethane Pipeline are operated in accordance with Australian Standard AS 2885.

The standard requires pipeline operators to:

- develop operating procedures based on the requirements of the standard
- ensure that operating personnel are suitably qualified, trained and experienced
- ensure that changes to the original design of the pipeline are fully assessed to ensure that the integrity of the pipeline is not impaired and that the safety of the public, operating personnel and/or protection of the environment is not diminished
- ensure the appropriate inspections, assessments and maintenance activities are completed
- establish safe systems of work for pipeline repairs.

APA Group has implemented a range of measures to ensure that the risks associated with the operation of the pipeline are reduced to ALARP. Measures to minimise the risk of third party interference include:

- implementation of a regular inspection plan to identify any activity near the pipeline which may cause a danger to the buried facilities or pose a threat to third parties;
- implementation of the contact program with all land owners and occupiers and provision of pipeline safety information,
- provision of 24 hour ‘Dial Before You Dig’ contact number and pipeline location service;
- implementation of the community awareness program involving presentations to local contractors, emergency providers and utilities in areas along the pipeline route to educate personnel on the nature of the pipeline, contents, correct work procedures for the easement and emergency procedures;
- maintenance of pipeline warning signs along the pipeline route; and
- provision of buried markers above the pipeline in areas of increased risk from excavation e.g. road crossings.

In addition, APA Group has in place a range of advanced monitoring and control techniques to ensure the safety and security of the pipeline and facilities. These measures include:

- a 24 hour pipeline control centre incorporating monitoring and control systems that continuously receive and analyse pipeline operating reports;
- vibration, fire and gas leak detectors;
- ‘intelligent pigging’ operations, in which detection equipment travels inside the pipeline checking for abnormalities and corrosion;
- a system of remote controlled valves which allow a pipeline controller to shut off gas flow and isolate any portion of the pipeline; and
- routine physical surveillance of the pipeline easement via aerial monitoring and vehicle patrols as necessary.

6 Environmental Management

6.1 Environmental Objectives

Environmental objectives have been developed for the MSP and Ethane pipelines based on the information and issues identified in this document. These objectives have been designed to provide a clear guide for the management of environmental issues during the operation of the pipeline. The objectives are provided in the Pipeline Licence 7 & 8 Statement of Environmental Objectives (Operations) (APA Group 2010).

6.2 Environmental Management System

APA Group has developed and implemented a Health, Safety and Environment (HSE) Management System which applies to all APA Group activities. The HSE Management System is a key tool in managing the environmental responsibilities, issues and risks associated with operational activities. It provides a framework for the management of environmental issues through the:

- Establishment of a Health, Safety and Environment Policy
- identification of environmental risks and legal and other requirements
- setting of appropriate environmental objectives and targets
- establishment of a structure and program to implement the
- facilitation of planning, control monitoring, corrective action, auditing and review of activities to ensure that the requirements of the HSE Policy are achieved.

The HSE Management System includes standards, management plans, procedures and a training, induction and auditing program. Information on these components is provided in the following sections.

6.2.1 HSE Policy

APA Group is committed to responsible environmental management of all its assets. All pipeline operations activities must be undertaken in accordance with the Health, Safety and Environment Policy (Appendix 1). APA Group is committed to achieving the environmental objectives outlined in the corresponding SEO.

6.2.2 Environmental Management Plans

APA Group's Environmental Management Plan for the MSP pipeline details the environmental control measures that apply for the operation of the pipeline and ancillary facilities. These measures are largely based on the Australian Pipeline Industry Association (APIA) Code of Environmental Practice. Where additional or site specific control measures are required to manage a particular issue, environmental documentation will be prepared.

6.2.3 Permit to Work and Job Hazard Analysis

Permit to Work and Job Hazard Analysis are used to identify and control risks to health, safety, the environment and security of gas supply. These processes are utilized for all pipeline operational activities.

7 Consultation

APA Group maintains regular contact with the landholders and other directly affected stakeholders (e.g. Santos) as a standard part of the pipeline operations.

Consultation with relevant stakeholders regarding environmental objectives for operations will be carried out by PIRSA during the MSP and Ethane Pipeline Operations SEO approvals process. APA Group consider the PIRSA consultation process to be adequate for the on-going operation of the MSP and the Ethane pipeline as operational activity is considered to be low impact and very few stakeholders are directly affected by operational activities. As a consequence APA Group have not undertaken any specific consultation with stakeholders for the operation of the MSP and the Ethane pipeline.

Key stakeholders for the pipelines include:

- PIRSA
- Department for Environment and Heritage (DEH) including National Parks and Heritage Branch
- Department for Water, Land and Biodiversity Conservation (DWLBC), including South Australian Arid Lands Natural Resources Management Board, Native Vegetation Group
- Environment Protection Authority (EPA)
- Department for Transport, Energy & Infrastructure (formerly Transport SA)
- Pastoral lease holders
- Santos and other petroleum operators
- Native Title groups
- Cooper Creek Catchment Committee.

APA Group aims to continue to engage stakeholders for the duration of its pipeline operation activities to ensure that all potential concerns are identified and appropriately addressed.

8 References

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9 Abbreviations

ºC	Degrees Centigrade
ANZECC	Australian and New Zealand Environment and Conservation Council
APIA	Australian Pipeline Industry Association Inc
AS 1940	Australian Standard *AS 1940 Storage and Handling of Flammable and Combustible Liquids*
AS 2885	Australian Standard *AS 2885 Pipelines – Gas and Liquid Petroleum*
BDBSA	Biological Databases of South Australia
BoM	Bureau of Meteorology
DEH	Department for Environment and Heritage (South Australia)

DEWHA	Department of the Environment, Water, Heritage and the Arts (Commonwealth)
DTEI	Department of Transport, Energy & Infrastructure (South Australia)
DWLBC	Department of Water, Land & Biodiversity Conservation (South Australia)
EIR	Environmental Impact Report prepared in accordance with Section 97 of the South Australian *Petroleum and Geothermal Energy Act 2000* and Regulation 10
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999 (Commonwealth)
GIS	Graphic Information System
MAOP	Maximum Allowable Operating Pressure
ML	Megalitre (10^6 litres)
MPa	mega pascal
MSP	Moomba to Sydney Pipeline
NPW Act	*National Parks and Wildlife Act* 1972 (South Australia)
PL	Pipeline Licence
PIRSA	Department of Primary Industries and Resources, South Australia
RNE	Register of the National Estate
RTU	Remote Telemetry Unit
ROW	Right-of-way
SCADA	Supervisory Control and Data Acquisition
SCB	Soil Conservation Board
SCC	Stress corrosion cracking
SEO	Statement of Environmental Objectives
SMYS	Specified minimum yield stress
TJ	Terajoules (10^{12} Joules)

10 Glossary

battered	Recontoured to provide a stable angle of slope.
bellhole	An enlarged area of trench.
berms	Banks of soil placed on slopes to prevent erosion.
blowdowns	The deliberate controlled venting or release of gas from a pipeline or associated equipment into the atmosphere (e.g. during maintenance, testing or emergencies).
borrow pit	Surface excavation for the extraction of materials such as sand or clay.
bund	An earth, rock or concrete wall constructed to prevent the inflow or outflow of liquids.
cathodic protection system	Application of an electrical current to the pipeline exterior to prevent the electrochemical process of corrosion occurring.
easement	A right held by the proponent to make use of the land for the installation and operation of a pipeline. Also referred to as a right-of-way.
ephemeral	Existing for only a short time, often dependant upon climatic influences.
fugitive emissions	Substances that escape to air from a source not associated with a particular process, such as leaks from equipment.

hydrostatic testing (or hydrotesting)	A means to check the pipeline for strength and leaks prior to operation in which the pipeline is filled with water and the pressure increased and monitored under controlled conditions.
intelligent pig	Electronic device inserted into the pipeline at regular intervals (for example, every ten years) to clean and check the integrity of the line.
mainline valves	Valves located in a pipeline at intervals along its length.
meter stations	Facility where the flow of gas is measured, particularly where gas is to be reticulated or transferred to local gas users.
Native Vegetation Council	A council established under the South Australian *Native Vegetation Act 1991* to assess vegetation clearance applications.
pig	A tool which is inserted into the pipeline and carried by the gas flow to clean the pipe wall, separate the gas, or inspect the pipeline.
pig receiver	An above ground facility used to launch and receive pigs which have been inserted into the pipeline system.
purging	Removing all air from the pipeline, using gas.
radiography	Non-destructive examination of pipeline welds using X-ray to detect any defects.
Ramsar wetland	A Wetland of International Importance listed under the Ramsar Convention (held in Ramsar, Iran 1971).
ripping	The use of machinery to rake or shallow plough soil to relieve compaction and aerate soil.
scarifying	The creation of shallow incisions or furrows in soil, usually by using machinery with tynes, in order to loosen compaction and allow the infiltration of water and seeds
stress corrosion cracking	A form of environmentally assisted cracking in pipelines where the surrounding environment, pipe material, and stress act together to reduce the pipe's strength or load-carrying capacity.
trench spoil	Soil from the pipeline trench.
trench water	Water (usually shallow groundwater) in the pipeline trench.
venting	The deliberate release of gas from a pipeline into the atmosphere (e.g. during maintenance, testing or emergencies).

Appendix 1:

Health, Safety and Environment Policy

Health, Safety & Environment Policy

The APA Group has legal and moral obligations to provide an injury free working environment and ensuring that all business activities are conducted in a manner that protects the environment and greater community.

APA Group is committed to a positive culture based on continuous improvement in health, safety and environmental performance for a sustainable future.

To achieve this standard APA Group will:-

- Comply with current applicable health, safety & environment legislation and best practice requirements to which APA Group subscribe.
- Provide leadership and direction to drive management accountability for the performance of our health, safety & environment management system.
- Assess the risks to health, safety and the environment that may be affected by the company's activities in order to eliminate or minimize that risk.
- Provide and maintain safe systems of work and codes of practices.
- Provide adequate and appropriate training, supervision and specialist support to health, safety & environment matters.
- Proactively reduce the risk of accidents, incidents and near misses. Investigate all reported accident, incidents and near misses promptly and to take appropriate actions to prevent a reoccurrence.
- Communicate and keep informed employees, contractors and other relevant parties of our health, safety & environment systems and processes.
- Partner with contractors with the same health, safety & environmental standards and values as APA Group.
- Regularly monitor the performance of health, safety & environment against established standards, both internal and external.

General Responsibilities for Health, Safety and Environment

Every employee (permanent or temporary) has a legal obligation to look after their own health and safety, and the safety of those who may be affected by their acts or omissions. They must also comply with the company's HSE policies and procedures. They must report all accident, incident and near misses.

All managers and supervisors are responsible for managing HSE in accordance with company policy as an integral and obligatory duty of their position.

Contractors and sub-contractors have a legal obligation to look after their own health and safety, and the safety of those who may be affected by their acts or omissions. They must also comply with all applicable health, safety and environmental legislation and local site rules.

Mick McCormack – Managing Director

This policy statement will be reviewed periodically to ensure that it remains relevant and appropriate to the organisation.
Revised date: July 2008
For Review: 2010

Appendix 2:

Rare or Threatened Flora and Fauna Recorded within 20 km of the Pipelines

Species	Common Name	Conservation Status	
		C'wealth	SA
FLORA			
Gratwickia monochaeta		-	R
Ophioglossum polyphyllum	Large Adder's-tongue	-	R
Swainsona oligophylla		-	R
FAUNA			
Birds			
Anhinga novaehollandiae	Australasian Darter	-	R
Falco hypoleucos	Grey Falcon	-	R
Hamirostra melanosternon	Black-breasted Buzzard	-	R
Oxyura australis	Blue-billed Duck	-	R
Phaps histrionica	Flock Bronzewing	-	R
Mammals			
Notomys fuscus	Dusky Hopping-mouse	V	V
Reptiles			
Aspidites ramsayi	Woma	-	R

Conservation status under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and SA *National Parks and Wildlife Act 1972*: R – Rare, V – Vulnerable

Source: Biological Databases of South Australia (DEH 2009)