1. EXECUTIVE SUMMARY

This document is the Executive Summary for the Field Environment Management Plan (FEMP) for Central Petroleum Limited (CP) operations at Palm Valley Gas Field (PVGF) in Operating Licence 3, henceforth referred to as OL3.

The operations at PVGF commenced in August 1983, the field supplies natural gas to the Northern Territory market, including production and gas sales to Alice Springs. The operational area under OL3 is well delineated and the risks of operations to the environment are well known from years of learning and managing the PVGF operations.

The operational activities covered by this FEMP include:

- Civil maintenance including road, track and lease maintenance (including maintenance of existing infrastructure);
- Repair, replacement and maintenance of gathering flowlines and associated equipment (gathering network is above ground (exception is road crossings);
- Produced water management within existing facilities
- Shutdown maintenance activities including cold venting;
- Routine well head maintenance and function testing (not include the removal of any permanent barriers);
- Routine wireline activities as identified in the approved Reservoir Management Plan (RMP)
- Operations repair and maintenance of existing facilities;
- Pipeline and flow line operations, maintenance and repair including pigging (does not include pipelines as defined under the *Energy Pipelines Act*);
- Maintenance and repairs of existing processing facilities including the direct replacement of obsolete or irreparable equipment
- Grey water and waste water system maintenance;
- Fuel and chemical storage, handling and transportation;
- General waste management;
- Weed control; and
- Maintenance of erosion and sediment controls.

This FEMP does not address general health and safety.

The facilities referenced in the scope are in relation to existing facilities, infrastructure and assets. The scope does not include new construction activities of facilities, new or additional land clearing, new infrastructure or upgrades to existing facilities.

NOTE:

Regardless of the above list, if the environment impacts and/or outcomes posed by an activity are not risk assessed in this FEMP then the activity will not be undertaken.

A revised or separate EMP will be submitted where proposed activities are not covered by the above scope and/or not covered by the FEMP risk assessment. CP will revise and re-submit the FEMP where there is a new or increased environmental risk not covered by the plan (as per Section 17 of the Petroleum (Environment) Regulations).

CP will contact the regulator for advice where it is unclear if proposed activities are covered by the FEMP.

1.1 Location

The PVGF is located in OL3 which is situated in the Amadeus Basin, approximately 154 km west of Alice Springs (by road) in the Northern Territory.

The nearest population centre is the community at Hermannsburg (also known as Ntaria) to the north east of the gas field. The gas field lies within Aboriginal freehold land administered by the Central Land Council (CLC).

Key topographic features of the area include:

- Mount Hermannsburg 1.2 km north east of the PVGF
- Finke Gorge National Park to the south of the PVGF and has overlapping boundaries with OL3; and
- Finke River to the east.

A map of the general location of OL3 is shown in Figure 1-1.

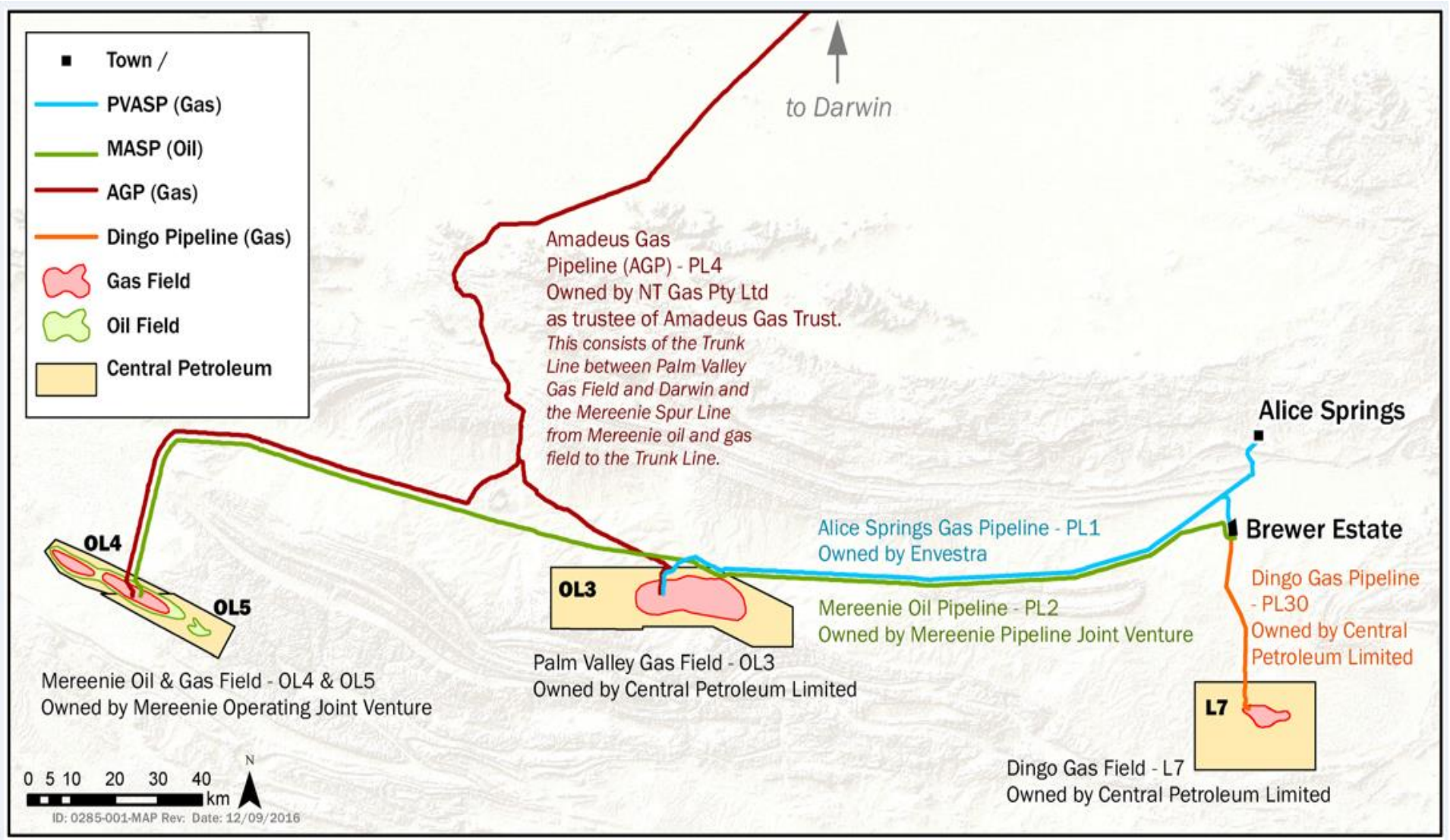

Figure 1-1 Map of general location of the Palm Valley Gas Field

1.2 Proponent

CP is an Australian Securities Exchange (ASX) listed junior exploration and production company registered on the 7th, March 2006 under the Corporations Act 2001. CP operates the largest holding of prospective onshore acreage in Australia totalling over 229,000 km2, c.57 million acres. This acreage includes permits already awarded and acreage under application with 209,000 km2 under the Petroleum Acts and 20,000 km2 under the Mining Acts mainly in the Northern Territory with smaller holdings in Western Australia, South Australia and Queensland.

Table 1-1 Central Petroleum Company Details

Company Name	Central Petroleum Limited
ACN/ABN	ABN: 95 009 718 183
Street Address	Level 7/369 Ann Street, Brisbane QLD 4000
Postal Address	PO Box 292 Brisbane, Qld, 4001
Telephone	+61 (0)7 3181 3800
Facsimile	+61 (0)7 3181 3855
Key Contact	Ben Visser, General Manager - Operations
Email	info@centralpetroleum.com.au
Website	www.centralpetroleum.com.au

1.3 Purpose

The purpose of the FEMP is to:

- Provide information to the NT Government as required under Section 45 (1) (f) of the Petroleum Act 2016;
- Provide additional information as required by the *Petroleum (Environment) Regulations 2016*;
- Provide information to the NT Environment Protection Authority (EPA) to make an assessment under the *Environmental Assessment Act 2013,* if required;
- Communicate environmental aspects, risks, management measures and responsibilities to CP personnel and contractors; and
- Provide a basis for environmental audits of the PVGF.

1.4 Brief Description of Key Sensitivities in the Receiving Environment

1.4.1 Finke Gorge National Park

Located along the southern boundary of OL3 is the Finke Gorge National Park. It protects many conservation significant and endemic flora and fauna species. The rock holes and water springs at Palm Valley are within the protection of the Finke Gorge National Park and include the red cabbage palm (*Livistona mariae ssp. mariae*). The key conservation significance of the Finke Gorge National Park includes:

- Preservation of current and past cultural and heritage values – both indigenous and non-indigenous;
- Conservation of endemic and threatened flora and fauna; and
- Continually sustainable use of the area for 4WD tourism.

The Finke Gorge headwater system to the north of OL3 is considered a nationally important area due to the number of conservation significant and endemic species. The PVGF has been in operation since the 1980's and has had no impacts on either of these nationally important areas, future risk to conservation significance of these areas is considered low; with mitigation and monitoring measures proposed in this FEMP.

1.4.2 Indigenous cultural heritage

CP has a current CLC Sacred Site Clearance Certificate for the PVGF existing operations on OL3 (C2015-035). CP will seek the necessary approvals and CLC Sacred Site Clearance for any new proposed activities within the OL3 area.

1.4.3 Non-indigenous cultural heritage

The Protected Matters Search Report (PMSR) retrieved for the OL3 area identifies one National Heritage Place, The Hermannsburg Historic Precinct (Appendix 3 – Main FEMP), which is located within 25 km of OL3.

1.4.4 Flora and Fauna

A flora or fauna species is considered in the FEMP to be of conservation significance if it is:

- Listed as Critically Endangered (Cr), Endangered (En), or Vulnerable (Vu) under the TWPC Act and has been recorded in the NT Flora Atlas within a 25 km buffer of the OL3 area or has been recorded on field surveys of the area; or
- Listed as Cr, En, Vu or Conservation Dependent under the EPBC Act and is identified by a Protected Matters Search Report (PMSR) for the area or has been recorded in the NT Flora Atlas within a 25 km buffer of the OL3 area; or has been recorded on LES field surveys of the area.

There are no flora species of conservation significance matching these criteria identified within the OL3 area on either the NT flora database or by the PMSR.

There are 27 fauna species of conservation significance identified as potentially occurring within the OL3 area from the NT fauna database and the PMSR. Since PVGF has been in operation there have been no incidents or impacts on the conservation significant fauna identified as potentially occurring within the OL3 area. Continued operations at current approval levels does not require species specific conservation management plans or mitigation measures.

1.4.5 Groundwater

The porous shallow underlying sandstone, near the surface, is an aquifer which adsorbs flows from rivers and creeks. “Rainfall in the area is adsorbed in the soft sandstone on the top, seeps downward through cracks and pores and is forced upward in the sandy gravel” (Moore 2005). In locations where this occurs, the roots of plants have access to a plentiful supply of water. The Stokes siltstone and shale provide an impermeable layer between the fresh water sandstones in the Mereenie formation from the underlying Stairway and Pacoota formations which contain the gas and hypersaline produced water.

1.4.6 Surface water

There are several major ephemeral streams that join the Finke and Little Palm Creek from the OL3 area. Ellery Creek and the Finke River run through the eastern third of OL3; Ellery Creek joins up with the Finke River south of OL3. The Finke River runs out into Lake Eyre during extreme events. The Finke River headwater gorge system is nationally recognised as a significant site, due to the abundance of conservation significant and endemic species but is located upstream from PVGF and outside of the OL3 area.

1.5 Description of the Activity

1.5.1 History

The Palm Valley gas field is situated on the Palm Valley anticline in the central northern Amadeus Basin of the Northern Territory, Australia. The field supplies natural gas to the Northern Territory and East Coast of Australia market. Production and gas sales to Alice Springs commenced in August 1983 and gas sales to Darwin commenced in October 1986 under 25-year term contracts. A sales agreement was renewed on the 16th January 2012 under a 17 year term contract.

PVGF is normally operated on a 24/7 basis by on site CP personnel. The PVGF can also be operated, monitored and controlled remotely from the Dingo Gas Field (Dingo) control room located at Brewer Estate south of Alice Springs. The key production management decisions are provided by senior CP personnel located in Brisbane.

The production facilities, as shown in Figure 1-2, consist of:

- Wellheads;
- Gathering System;
- Central Compression Station (CCS); and
- Central Treatment Plant (CTP).

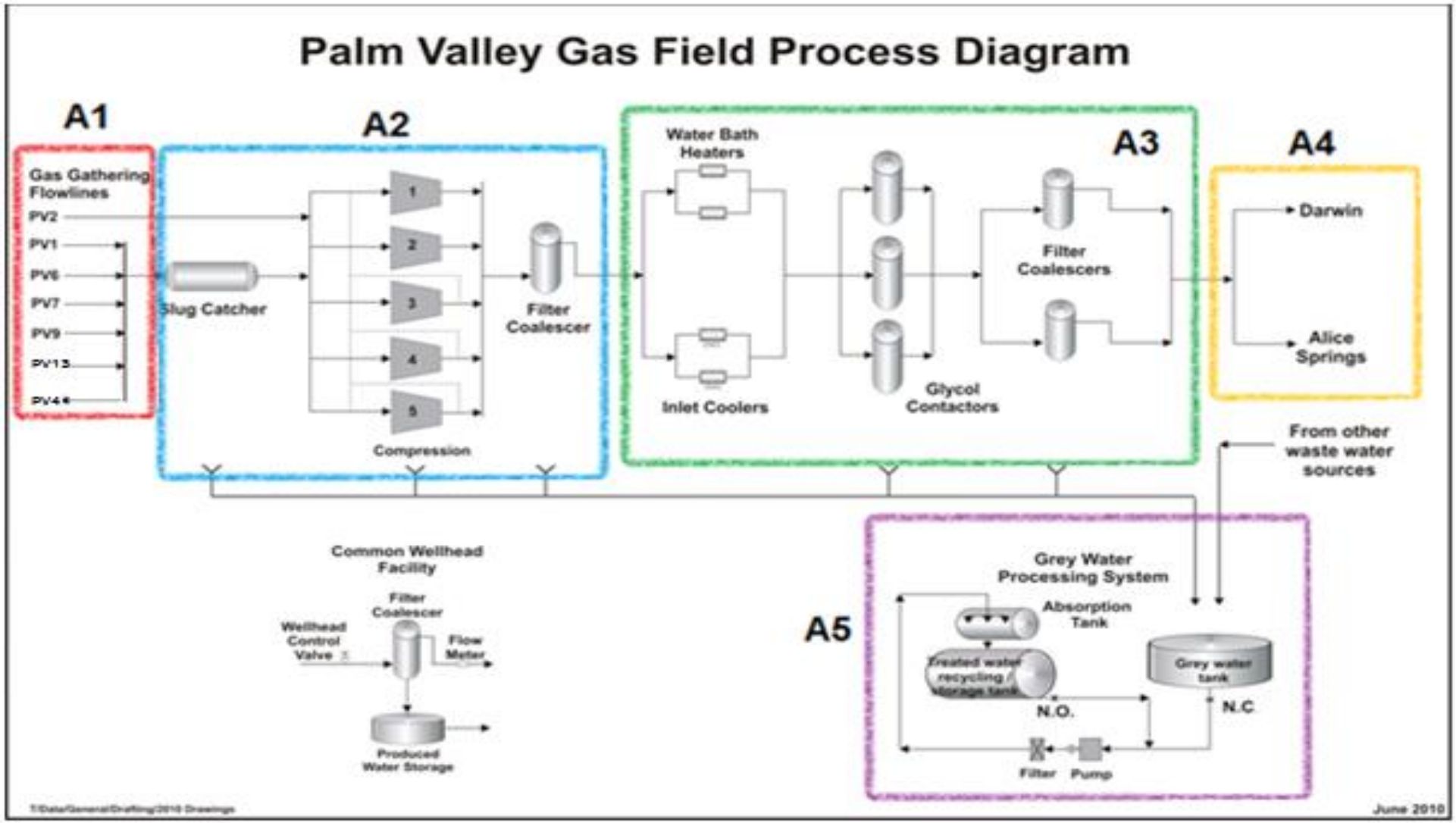

Figure 1-2 Palm Valley Gas Field Process Diagram

Table 1-2 Operational areas at PVGF relating to the field diagram in Figure 1-2

Area	Facility	Purpose
1. A1 Input	Wells, Gathering system	Collection of gas from operating gas wells, removing the majority of produced fluids (predominately saline to brackish water) at the well head. Gathering lines are above ground with the exception of road crossings.
2. A2 Process	Central Compression Station (CCS) – Slug catcher – Compressors – Filter Coalescer	Further free liquids are removed in the slug catcher before entering the CCS. In the CCS the water saturated gas is compressed to required pipeline pressure to feed into the CTP.
3. A3 Process	Central Treatment Plant (CTP) – Gas treatment: – Heaters and Coolers – Glycol contactors	Processing of gas to reach sales export quality. Main technique is addition of glycol to remove water vapour and other impurities from the gas. The workshop, offices and accommodation is adjacent to the CTP.
4. A4 Output	Gas Sales – Pipeline transfer	The PVGF is capable of providing natural gas directly into both pipelines: the Amadeus Gas Pipeline (owned and operated by APA) and the Alice Springs Pipeline
5. A5 Output	Waste water processing facility	Waste water (from wash down or run-off water) treated to reduce hydrocarbons and salt concentrations and disposed of through a licensed company

1.6 Chemicals and Hazardous Materials

All chemicals and hazardous substances at PVGF are managed in accordance with CP's Chemical and Hazardous Materials Management Procedure (Document MSTD11-PC002). A Hazardous Chemical Goods Register (HCGR) is kept for all sites and facilities operated by CP. It details:

- Product Name;
- Substance Name;
- Storage Locations;
- Current MSDS;
- Hazardous Goods (Yes/No);
- Dangerous Goods (Yes/No);
- Class & Packing Group;
- Quantity;
- Risk Assessment;
- Comments (Use, if still holding etc.)

A copy of the current HCGR for PVGF is provided in the PVGF FEMP. Chemicals and other hazardous substances are stored in accordance with the requirements of their relevant Safety Data Sheet (SDS).

Central Petroleum will comply with explosives and dangerous goods and health and safety legislation as well as codes of practice and Australian standards for purchasing, storage, handling and disposal of chemicals and hazardous substances.

1.7 Risk Assessment

An environmental risk assessment has been conducted for all operations at PVGF. Following CP's risk assessment process, the operational activities that have a potential to impact on the environment have been assessed and mitigated to reduce the residual risks to As Low As Reasonably Possible (ALARP) and meet CP's environmental outcomes and standards. Table 1-3 provides a summary of the residual risks associated with the operations of the PVGF. This summary indicates that the controls are effective, have been successfully managed to ALARP and therefore the residual risk has been accepted by CP. Refer to Sections 7 & 8 in the FEMP for more details.

Table 1-3 Count of residual risks for the operations of PVFG.

	Residual Risk			
	Low	Moderate	High	Critical
Count	13	1	0	0

1.8 Environmental Management

1.8.1 Central Petroleum's commitment to the environment

CP has a high standard of operatorship quality and integrity which far exceeds industry standards. CP has a high level of dedication toward the environment, as poor practices reflect poorly on profits and tarnish the company's reputation affecting future works and investment. It is because of these business and ethical reasons that CP has a galvanised environmental etiquette as well as operating under the highest standard of practices to limit all negative environmental impacts. This FEMP illustrates the preventative, mitigation, monitoring and auditing practices which CP does to limit impacts.

1.8.2 Environmental Outcomes, Performance Measures and Management Controls

Summary Tables 1-4 through to 1-16 provides an overview of CP's environmental management at PVGF. The tables indicate the environmental value for protection, the management objectives for the environment, the operational activities of PVGF, potential impacts from the activity, CP's management controls, CP's performance measures, CP's records to be taken and a summary of the risk assessment.

Table 1-4 Environmental Values and Objectives – Asset Integrity

Environmental Values	Protection of the ecosystem and human health values from uncontrolled discharges associate with asset integrity failures		
Management Objectives	Minimise impacts to ecosystem and human health values		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Operational activities • Maintenance activities	• Aquifer contamination • Loss of aquifer pressure • Contamination of groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems • Release of methane to atmosphere	**Asset Integrity - Subsurface** • Well reads and inspection as required by the Well Integrity Management System (this includes but not limited to pressure and/or gas flow rates) • Chemical treatment (biocide, corrosion inhibitor, anti-scaling) of produced water reinjection bore • Asset protection (Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use • Workover of wells if required (as described in the Reservoir Management Plan and the Well Monitoring Plan Palm Valley) • Monitoring of surrounding water bores and shut-in wellhead pressures for indications of gas migration **Asset integrity – surface facilities** • Management of change procedure for control of plant changes • Routine testing, inspection and preventative maintenance program (refer to maintenance management system) • Operate within safe operating envelope as protected by designed safety equipment and instrumentation • Asset protection (Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use	
Performance Measures	• No asset integrity failures • No uncontrolled releases		
Records	• Management of change records • Asset installation records • Records of inspections, monitoring testing and maintenance • Training and induction records • Emergency response plans • Record of the leak detection volume • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum's incident reporting system		
Residual Risk	**Moderate**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-5 Environmental Values and Objectives – Chemicals and Hazardous Materials

Environmental Values	• Protection of ecosystems and human health values from uncontrolled releases of chemicals and hazardous materials			
Management Objectives	• Minimise impacts to ecosystem and human health values			
Activity	**Potential Impacts without Management Controls**	**Management Controls**		
• Civil maintenance • Operations activities • Storage of chemical/hazard material • Transport of chemical/hazard material	• Loss of containment of chemicals and hazardous materials • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	• Register of hazardous materials maintained on site • All hazardous materials stored in appropriately bunded areas • Chemicals and hazardous goods stored in accordance with Dangerous Goods and Chemical Management procedure (MSTD09-PC019) • All chemicals and hazardous materials to be managed in accordance with Chemical/ Hazardous Materials Management Procedure (MSTD11-PC002) • Spill kits are available where hazardous materials are used and personnel trained in their correct use • Spill response measures shall be implemented for spills or leaks. • Emergency response plan is in place for responding to contaminant releases • Spill areas will be Identified and remediated in accordance with the National Environmental Protection Measure (NEPM) requirements • Use of drip trays when refuelling equipment • Plant and equipment inspected and maintained regularly to detect and prevent leakage of liquid contaminants (refer to maintenance management system) • Groundwater monitoring to detect any impacts to groundwater quality from CP activities		
Performance Measures	• No uncontrolled releases of chemicals and hazardous materials • No incorrect storage and use of chemicals and hazardous materials			
Records	• Hazardous materials register to be maintained • Records of inspections, testing and maintenance to be maintained • Training and induction records to be maintained • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum's incident reporting system			
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**	
Risk Accepted	**Yes**			

Table 1-6 Environmental Values and Objectives – Produced Water Management

Environmental Values	• Protection of the ecosystem and human health values from uncontrolled discharges associated with produced water management		
Management Objectives	• Minimise impacts to ecosystem and human health values		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Produced water Operational activities • Maintenance activities • Transport of saline produced water • Storage of saline produced water • Disposal of saline produced water	• Loss of containment of produced water • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	• Relevant staff trained and inducted into the storage, handling and transport of produced water. • Recording and monitoring of the volume of leakage from PV-09 leak detection system • Transport of waste under the requirements of the Waste Management and Pollution Control Act • Sufficient free board (200mm) maintained in evaporation pond to sustain a 1 in 100-year rainfall event • Bunding for tank storage of waste in a storage facility should be 120% of total volume of largest tank and located away from drainage lines. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • Contaminated material (e.g. contaminated soil) is appropriately contained and disposed using approved waste disposal company • Monitoring of seepage volume from evaporation pond • Refer to “asset integrity – surface facilities” control	
Performance Measures	• No asset integrity failures • No uncontrolled releases of produced water		
Records	• Management of change records • Asset installation records • Records of inspections, monitoring testing and maintenance • Training and induction records • Emergency response plans • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum’s incident reporting system		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-7 Environmental Values and Objectives – Waste Management

Environmental Values	• Maintain the integrity of ecosystems and agricultural productivity • Minimise the amount of waste generated	
Management Objectives	• To minimise impacts on soil, surface water, groundwater, sensitive habitat and air quality • To minimise creation of food sources or habitat for pest species • To minimise waste generation through reduce, reuse, recycle programs	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Civil maintenance • Operational activities • Produced water and oily water disposal • Camp and office operations • Domestic waste production • Waste production from the treatment process • Accumulation of Naturally Occurring Radioactive Material (NORM)	• Contaminated land, surface water, shallow groundwater • Encouragement of pest species to waste sites • Contamination ground and surface waters • Reduction in air quality • Higher levels of NORM contaminating soils and groundwater and exposure to people	• Bunding for storage of regulated wastes material contained in drums with capacity of at least 25% of the total volume of stored material • No waste or hazardous material stored with potential for over flow impact on water courses • All liquid storage to maintain adequate freeboard for an ARI of 1 in 100 years • All waste stored appropriately and fitted with secure, fauna proof lids • All hazardous waste material separated in the appropriate area for disposal according to their SDS and the hazardous goods register • All waste handling (e.g. transport, storage, treatment, recycling and disposal) is approved, conducted by an appropriately licenced contractor and/or facility where appropriate. Records of transport and disposal to be kept • All Listed Wastes as per the Waste Management and Pollution Control (Administration) Regulations to be handled by a Listed Waste Company as per the NT EPA website (https://ntepa.nt.gov.au/waste-pollution/approvals-licences/listed-waste) • For waste transported across state or territory borders, the National Environment Protection Measure (NEPM) 2013 Guidelines for Waste Transport will be adhered to • Sewage treated and solids disposed off-site by licensed contractor, with water released into rubble drains onsite • Regular inspection of waste containers to ensure no leaks. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • No incineration of waste • Relevant staff trained and inducted into the storage, handling and transport of hazardous wastes • Perform an initial test for NORM as soon as practicable after the restart of the PV facility • Based on the outcome of the initial test, develop an appropriate NORM management plan in line with the Safety Guidelines issued by APRANSA. • Train personnel on the hazards of NORM, risk of exposures and controls in place to monitor • Ensure of the correct PPE is provided when there is the potential for personal to be exposed to NORM
Performance Measures	• The outcomes of waste management practices can be assessed against the performance criteria for: • Absence of domestic waste remaining onsite at completion of activities (i.e. general rubbish, waste chemicals, workshop wastes including oily rags, containers etc.). • No unregulated waste handling. • Pest species not encouraged to the site. • All waste certificates to be noted and accounted for • NORM exposure understood and management plan in place	
Records	• Waste registers to be maintained • Waste disposal records to be maintained (all waste certificates to be noted and accounted for) • Records of waste storage site inspections to be maintained	

	• Incidents of uncontrolled waste releases will be reported in CP's incident reporting system and corrective action initiated. Reportable incident records and regulatory notifications will be maintained. • Regulatory reporting under the NPI • NORM testing records		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-8 Environmental Values and Objectives – Erosion and Sediment Control

Environmental Values	• Suitability and stability of land for existing uses (Erosion and Sediment Controls implemented) • Stability of land to preserve existing water quality, landscapes and ecosystems	
Performance Objectives/Outcomes	• Minimise disturbance to land and land use (including soils and terrain, flora and fauna) • Minimise erosion (via water or wind) and sediment releases • Protection of waterways. • Return disturbed areas to a stable landform such that they are returned to a condition as close as practicable to the surrounding area (or pre-disturbance state) within an acceptable time frame. • Protect the productivity of the land for its intended land use	
Activity	**Potential Impacts without Management Controls**	**Management Controls**

• Civil maintenance
• Operational activities
• Rehabilitation activities
	• Soil erosion and sedimentation
	• Loss of soil productivity
	• Flooding
	• Rehabilitation failure
	• Change in natural waterways and drainage channels
		• Erosion and sediment control devices installed where necessary in conformance with the DENR (https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control) and International Erosion Control Association (IECA) guidelines
		• Current controls in place includes:
		  ○ diversion banks
		  ○ whoa boy's
		  ○ no windrows or concentration points
		  ○ drainage channel
		  ○ regular inspections
		  ○ berms to avoid sedimentation run-off
		• Proposed activity that has the potential for erosion and the movement of sediment, a specific erosion and sediment plan will be developed by a suitably qualified person. All controls within the site specific plan will be auditable.
		• After significant rainfall rehabilitated surfaces and disturbed areas inspected to confirm.
		  ○ No erosion;
		  ○ No sedimentation;
		  ○ No blocking of drainage lines; and
		  ○ An indication of vegetation growth.
		• Restore disturbed areas
		• Landform consistent with surrounding environment, no blocking of drainage channels or water courses
		• No driving off unformed tracks
		• Restricted third party access
		• No unauthorised clearing
		• All erosion gully heads removed and flattened to encourage laminar flow and reduce further development of erosion
		• Manage pooling water

Performance Measures	• Land disturbance equal to or less than planned • Minimum incidences of erosion and sedimentation occurring	

	• Areas left safe, stable and non-polluting • Commence to rehabilitate disturbed areas within 12 months of decommission • No new erosion flow paths originated from site • No flow on effects caused by flooding at CP's operational sites		
Monitoring and Records	• The extent of disturbances will be measured and uploaded to a Geographic Information System (GIS). • Monitoring for soil erosion and related issues is best undertaken at critical stages, such as: o After completion of a specific phase of activity all areas disturbed should be inspected for early signs of compaction, erosion and soil degradation (generation of bulldust) o When accessing the site after the wet season look for signs of erosion. If significant impacts are identified remediation works may need to be conducted prior to continued vehicular access. o After more than 20 mm of rainfall • Where rehabilitation of a site is undertaken, rehabilitation will be monitored until the site is reinstated		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-9 Environmental Values and Objectives – Decommissioning and Rehabilitation Management

Environmental Values	• Maintain the integrity of significant ecosystems and agriculture productivity • Maintain habitat elements for native flora and fauna, including species protected by EPBC Act and TPWC Act		
Management Objectives	• A safe, stable landform consistent with surrounding land use • Rehabilitation of disturbed areas is returned to the original land use and is consistent with the adjacent analogue site		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Decommissioning and rehabilitation activities	• Rehabilitation failure • Loss or endangerment of threatened species • Loss of fauna and flora habitat • Loss of re-established habitat • Rehabilitation failure, leads to future land degradation and flow on effects to the surrounding environment • Loss of soil productivity	• Rehabilitation to be implemented 12 months post decommissioning of the infrastructure • When rehab is to occur topsoil will be spread and area re-seeded with local native seed. If germination does not occur after appropriate rainfall over several years re-seeding will be conducted. • Vegetation survey conducted before disturbance to provide baseline reference to determine post revegetation success • Location of top soil mounds clearly marked and less than 1.5m high to protect the biological activity of the top soil • All compacted hardstands and laydown areas deep ripped to encourage infiltration and water retention • Return all disturbed landforms to as close as possible the natural terrain • Photographic point monitoring established before disturbance and continued after to identify any areas requiring further rehabilitation work • Appropriate management and control of waste materials on and off-site • No new weeds or non-native plants introduced, and appropriate weed management implemented, as per CP "Biosecurity Management" under this FEMP	
Performance Measures	• Successful rehabilitation to a similar condition of surrounding environment • No further habitat loss resulting from CP's activities • Continual decommissioning of redundant assets		
Records	• Records of rehabilitation monitoring • Inventory of decommissioned infrastructure • All incidents will be reported in Central Petroleum's incident reporting system and corrective action initiated.		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-10 Environmental Values and Objectives – Biosecurity Management

Environmental Values	• Maintain the integrity of significant ecosystems and agricultural productivity	
Management Objectives	• Avoid the introduction of weeds and pest fauna • Avoid the spread of existing weeds and pest fauna	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Vehicle movements • Civil maintenance • Operations and maintenance activities • Office and camp operations • Transport of fill materials • Water and food sources available	• Introduction or spread of weeds impacting native flora and fauna • Increased introduced species and predator species impacting on Flora and Fauna • Introduction of weeds impacts productivity of neighbouring properties	*Flora* • Activities will adhere to the guidelines within the NT Weed Management Handbook and "Preventing weed spread is everybody's business" (https://denr.nt.gov.au/__data/assets/pdf_file/0011/257987/preventing-weed-spread.pdf) • Weed desktop and field-based surveys undertaken to identify existing weed areas • Vehicle and machinery to undergo weed free checks and compliance before mobilised to site • Vehicles and/or equipment coming from a weed invested area is required to be weed free and needs to provide a weed free certificate before entry • Major equipment moves will be planned from weed-free areas to infested areas and not the other way around • Inspections and periodic audits will be conducted to identify and report weed outbreaks • New activities will be planned to address prevention of weed or non-indigenous plant spread • Weeds will be monitored for and actively controlled in the entire OL area • Ensuring all material imported to or between sites is free of weeds • Baseline training for staff members responsible for preventing, identifying and managing weeds undertaken • Vegetation survey conducted before and after any disturbance or clearing operations to determine if new noxious species present • Photographic monitoring before and after any disturbance • No driving off unformed tracks. *Fauna* • Refer to Management Controls for "Waste Management "for waste storage • No feeding of fauna • All standing water fenced, where practicable • Standing water removed if no longer required • All food stored inside or in sealed containers • Personnel are prohibited from bringing domestic pets onto the gas field area
Performance Measures	• No introduction or spread of declared weeds and/or pest fauna resulting from Central Petroleum's activities	
Records	• Records of weed distribution will be maintained within Central Petroleum's GIS and if required provided to the Weeds Officer at DENR & DPIR • Records of weed inspections will be maintained • All weed outbreak and pest fauna incidents will be reported in Central Petroleum's incident reporting system and corrective action initiated • It is noted that under the Weeds Management Act that: *'The owner and occupier of land must… within 14 after becoming aware of a declared weed that has not previously been, or known to have been, present on the land, notify and officer of the presence of the declared weed'*	
Residual Risk	**Low**	**Risk Control Effectiveness** / **Effective**
Risk Accepted	**Yes**	

Table 1-11 Environmental Values and Objectives – Biodiversity Management

Environmental Values	• Maintain the integrity of significant ecosystems and agriculture productivity • Maintain habitat elements for native flora and fauna, including species protected by EPBC Act and TPWC Act • Avoid clearing high value habitat		
Management Objectives	• Minimise disturbance to flora and fauna • Minimise disturbance to sensitive areas		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance of roads, drains, hardstands, erosion and sediment controls • Clearing of vegetation and potential habitat • Civil works required for rehabilitation	• Disturbance to environmentally sensitive areas and/or flora and fauna species • Disturbance of fauna • Loss or endangerment of threatened species • Loss of habitat • Impacts to the Slater Skink • Increased intensity of flooding can lead to vegetation degradation and habitat modification	• Ecological assessment to be undertaken to identify environmentally sensitive areas (flora and fauna habitat) prior to disturbance • Civil maintenance activities avoid clearance of mature vegetation • Adhere to permit to work system, which ensures that all activities stay within the approved operational area • No unauthorised clearing. • Signage placed adjacent to known slater skink habitat north of PV2 • Establishment of sediment controls on northern edge of PV2 laydown (currently in place) • Induction of staff to include locations of slater skinks, sensitive habitat areas and characteristics. • Ongoing monitoring of known population during annual audit • Refer to “Traffic and Transport Management” for driving control measures • Refer to “Erosion Sediment Controls” for flooding and run-off control measures	
Performance Measures	• Monitoring OL3 area to minimise impacts to fauna habitat and sensitive vegetation. • No native fauna impacts (injury or fatality). • No loss of sensitive vegetation resulting from CP’s activities.		
Records	• Records of disturbance will be maintained. • Records of inspections will be maintained. • All incidents will be reported in CP’s incident reporting system and corrective action initiated.		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-12 Environmental Values and Objectives – Bushfire Prevention

Environmental Values	• Maintain a natural fire regime of the region • Protection of public, private infrastructure and equipment		
Management Objectives	• Minimise the risk of causing bushfires from Central Petroleum's activities • To minimise impacts on environmental habitat and fauna, soil erosion, impacts on stakeholders, impacts on culturally significant sites, public infrastructure and community lands • To prevent accidental fire risk and ensure safe storage of chemicals		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operational activities • Venting • Vehicle and equipment movement • smoking	• Increased incident and intensity of bushfires can lead to vegetation degradation and habitat modification • Native fauna fatality • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands • Damage to or loss of culturally significant sites	• Fire extinguishers to be fitted to all vehicles • No burning of waste • Only diesel vehicles to be used • Appropriate firefighting equipment available and serviced • Staff trained in the emergency response procedures and basic firefighting skills and communications with neighbours maintained. • Firebreaks established and maintained around infrastructure (4 m fire break in accordance with NT requirements) • Availability of water to assist in fire control • Designated smoking areas with appropriate waste receptacles • Restricted vent access • No open flames or fires outside of designated areas • Ensure vegetation stockpiles are stored away from ignition sources and in low profile mounds	
Performance Measures	• Successful fire management will be indicated by having no uncontrolled fires occurring as a result Central Petroleum's activities.		
Records	• All incidents of fire to be recorded in CP's incident reporting system and corrective action initiated.		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-13 Environmental Values and Objectives – Air Quality Protection Measures

Environmental Values	• Rural air environment with qualities conducive to suitability for the life, health and wellbeing of humans and ecosystems		
Management Objectives	• Minimise environmental nuisance due to dust for sensitive receptors resulting from Central Petroleum's activities • Minimise greenhouse gas emissions		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Operational activities • Operational upsets • Wear and tear of gas fittings • Vehicle movements on unsealed roads • Civil maintenance	• Release of atmospheric contaminants from exhausts • Release of greenhouse gases from gas pipe fittings and wellheads • Dust emissions	• Refer to "Asset Integrity" management controls • Vehicles and equipment maintained and regularly serviced • Reduce speeds on unsealed roads • Monitor road conditions to ensure deterioration with possible increase in dust creation does not occur and undertake road rehabilitation as required • Dust control for civil maintenance • Watering of roads when appropriate and agreed with landholders • Monitoring of all venting events	
Performance Measures	• No complaints regarding dust/air quality • Amicable resolution of complaints.		
Records	• Annual NGERS and NPI reporting will be completed • Records of routine inspections for leaks will be maintained • All complaints and subsequent actions are to be recorded in Central Petroleum's incident reporting system and corrective action initiated		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-14 Environmental Values and Objectives – Traffic and Transport Management

Environmental Values	• Livelihood and well-being of local communities and towns		
Management Objectives	• Minimise impacts upon environmental values of the local community • Minimise impacts on cultural heritage • Minimise safety risks to the public and other third parties • Maintain and enhance partnerships with the local community, including using local contractors • No loss to the aesthetic or enjoyment factor for the community		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operational and maintenance activities • Increased traffic during plant turnarounds • Movement of heavy machinery on public roads	• Local community and landowners discontent • Increased potential for accidents and damage to infrastructure (eg arising from. Goods transportation and driver behaviours), • Increased occurrence of weed species • Loss of visual amenity impacting landholder, tourists or the wider community • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands • Fauna strikes / fauna fatality • Environmental harm from traffic erosion or incident	• Consult with surrounding stakeholders when major operation will occur • No unauthorised third-party access. • No driving under the influence of alcohol or drugs • Ensure vehicles are inspected regularly and have working lights and/or spot lights. • No off road driving • No speeding: Limit vehicle speeds to 60km/h on the access track, 40km/h between facilities and 10km/h around camp and facilities, except in the event of an emergency • Staff plan journeys in accordance to the CP Journey Management Plan • Limited driving at dawn and dusk • Refer to “Chemical and Hazardous materials Management” for transport	
Performance Measures	• An absence of issues raised by the community as indicator for successful communication • No unresolved complaints • The community is highly consulted with and all comments provided are assessed and those viable implemented • High level of satisfaction by the community • No vehicular accidents		
Records	• Register kept of all incidences relating to access issues, unauthorised access and requirements of pastoralists, recognising that these requirements may change seasonally • Track fauna strike/ near miss in the wild animal control register to enable knowledge sharing across CP personnel • Complaints register • Record of stakeholder engagement • Record of environment compliance • All traffic and transport incidents related to any contamination to the environment, erosion or loss of fauna to be recorded in CP’s incident reporting system • Corrective actions to be closed out and recorded		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-15 Environmental Values and Objectives – Community Impact Minimisation

Environmental Values	• Livelihood and well-being of local communities and towns	
Management Objectives	• Minimise impacts upon environmental values of the local community • Minimise impacts on cultural heritage • Minimise safety risks to the public and other third parties • Maintain and enhance partnerships with the local community, including using local contractors • No loss to the aesthetic or enjoyment factor for the community	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Civil maintenance • Operational and maintenance activities • Shut downs, projects and workovers • Office and camp operations • Release of waste • Noise generated during routine operations, maintenance and civils work. • Artificial lighting required for safety during 24-hour operation	• Local community and landowners discontent • Loss of visual amenity impacting landholder, tourists or the wider community • Noise generation causing a nuisance • Light pollution impacting sensitive receptors • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands	• All activities to stay within the approved operating areas (per the Sacred Site Clearance Certificate (ref. C2015-035)). • Where possible, employ local and/or Indigenous people. • Active stakeholder engagement and complaints management which includes consultation with surrounding stakeholders when operations likely impact on lighting, noise, vibration and visual amenity values (e.g. during shut down periods, major projects) • Refer to "Bushfire Prevention • Ensure that all CP's environmental standards, plans and procedure are met to not cause any impact to the community • All personnel and site visitors will complete the appropriate inductions ***Visual*** • Refer to "Waste Management" for spills, waste storage and transport. • Refer to "Chemical and Hazardous Materials Management" for spills, handling and transport • Refer to "Decommissioning and Rehabilitation Management" • Refer to "Erosion and Sediment Controls" for disturbance • Refer to Biosecurity Management" for weed and pest fauna management ***Noise*** • Refer to "Air Quality" for vehicle servicing ***Lighting*** • Minimal lighting used for safe operation of the plant and facilities
Performance Measures	• An absence of issues raised by the community as indicator for successful communication • No unresolved complaints • The community is highly consulted with and all comments provided are assessed and those viable implemented • High level of satisfaction by the community • No vehicular accidents • No off site release of contamination from road corridors	

Records	• Register kept of all incidences relating to access issues, unauthorised access and requirements of pastoralists, recognising that these requirements may change seasonally • Land access agreements closed out at completion. • Complaints register • Record of stakeholder engagement • Record of environment compliance • All traffic and transport incidents related to any contamination to the environment, erosion or loss of fauna to be recorded in CP's incident reporting system. Corrective actions to be closed out and recorded		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

Table 1-16 Environmental Values and Objectives – Cultural Heritage and Sacred Sites Preservation

Environmental Values	• Maintain cultural heritage values of the region, both Indigenous and non-Indigenous		
Management Objectives	• To avoid disturbance of or damage to Aboriginal or cultural heritage artefacts or Sacred Sites • To minimise impacts upon or disruption to activities of Indigenous stakeholders in culturally significant areas • To ensure adequate background information and training is provided to employees and contractors working in culturally significant areas • To ensure that the health and safety of workers and the community is not compromised through management of cultural and environmental awareness		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operations activities • Maintenance activities • Vehicle and equipment movement	• Disturbance to cultural heritage sites • Loss or destruction of cultural heritage sites	• Cultural Heritage Clearance (and identification of artefacts of Aboriginal significance in conjunction with the CLC and TOs) will be conducted prior to commencement of disturbance activities for civil maintenance • Adhere to permit to work system, which ensures that all activities stay within the approved operating areas • No unauthorised clearing • No unauthorised third-party access • Exclusion zones • No off road driving • Refer to “Bushfire Prevention”	
Performance Measures	• No incidences of disturbance of archaeological sites or sites of cultural significance		
Records	• A register is kept of all occurrences of archaeological sites identified for provision to the NLC, the AAPA and Heritage Branch within DLPE • Ensure that site personnel and contractors report all new discoveries of archaeological or cultural artefacts. Cease work and effect practical protection measures until the area can be assessed by appropriate personnel		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

1.9 Stakeholder Communications

1.9.1 Stakeholder Engagement

CP has established and continues to maintain enduring and mutually beneficial relationships with the affected stakeholder groups. We ensure that our activities generate positive economic and social benefits for and in partnership with these communities.

Stakeholder identification regarding PVGF was conducted and the relevant stakeholders are:

- The Hermannsburg community;
- The Landholders (in this case Traditional owners through the Central Land Council (CLC));
- The Northern Territory Government;
- Other key non-commercial external stakeholders (e.g. NGOs and industry bodies); and
- Industrial Relations stakeholders.
- Other commercial external stakeholders
- Internal stakeholders

Table 1-17 Stakeholder engagement

Public release of key documents;	Advertising and/or articles in relevant print media
Stakeholder needs survey	Media briefings, releases, and monitoring
Project newsletters	Responding to media enquiries
Public displays	Community workshops
Staffed Environmental Impact Statement displays	Public information sessions and meetings
Regular updates to central website	Project Information Line and email
Fact sheets	Written enquiry forms
Project sustainability reports	Face to face meetings with stakeholders and stakeholder groups
Native Title Representative Body meetings and briefings	Other direct and indirect engagement mechanisms

1.9.2 Ongoing Consultation

CP maintains a record of all past and future interactions and communications with stakeholders and affected parties for the PVGF. This information is maintained in a Communication Log. A copy of this will be submitted to the DPIR annually. The communication log to date is in Appendix 5 main FEMP.

PALM VALLEY GAS FIELD

FIELD ENVIRONMENT MANAGEMENT PLAN – 2019

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APPENDICES

1 INTRODUCTION

1.1 Operations

This document is the Field Environment Management Plan (FEMP) for Central Petroleum Limited (CP) operations at Palm Valley Gas Field (PVGF) in Operating Licence 3 (OL3).

The operations at PVGF commenced in August 1983, the field supplies natural gas to the Northern Territory market, including production and gas sales to Alice Springs. The operational area under OL3 is well delineated and the risks of operations to the environment are well known from years of learning and managing the PVGF operations.

1.2 Location

The PVGF is located in OL3 which is situated in the Amadeus Basin, approximately 154 km west of Alice Springs (by road) in the Northern Territory (NT).

Access to the field from Alice Springs is via a network of sealed and unsealed public and private roads, heading west from Alice Springs along Larapinta Drive/Red Centre Way to Hermannsburg, then turn left 6.5 km past the Finke River crossing near Hermannsburg.

The nearest populated community is at Hermannsburg (also known as Ntaria) to the north east of the PVGF. The PVGF lies within Aboriginal freehold land administered by the Central Land Council (CLC).

Key topographic features of the area include:

- Mount Hermannsburg 1.2 km north east of the PVGF
- Finke Gorge National Park to the south of the PVGF and has overlapping boundaries with OL3; and
- Finke River to the east.

A map of the general location of OL3 is shown in Figure 1-1

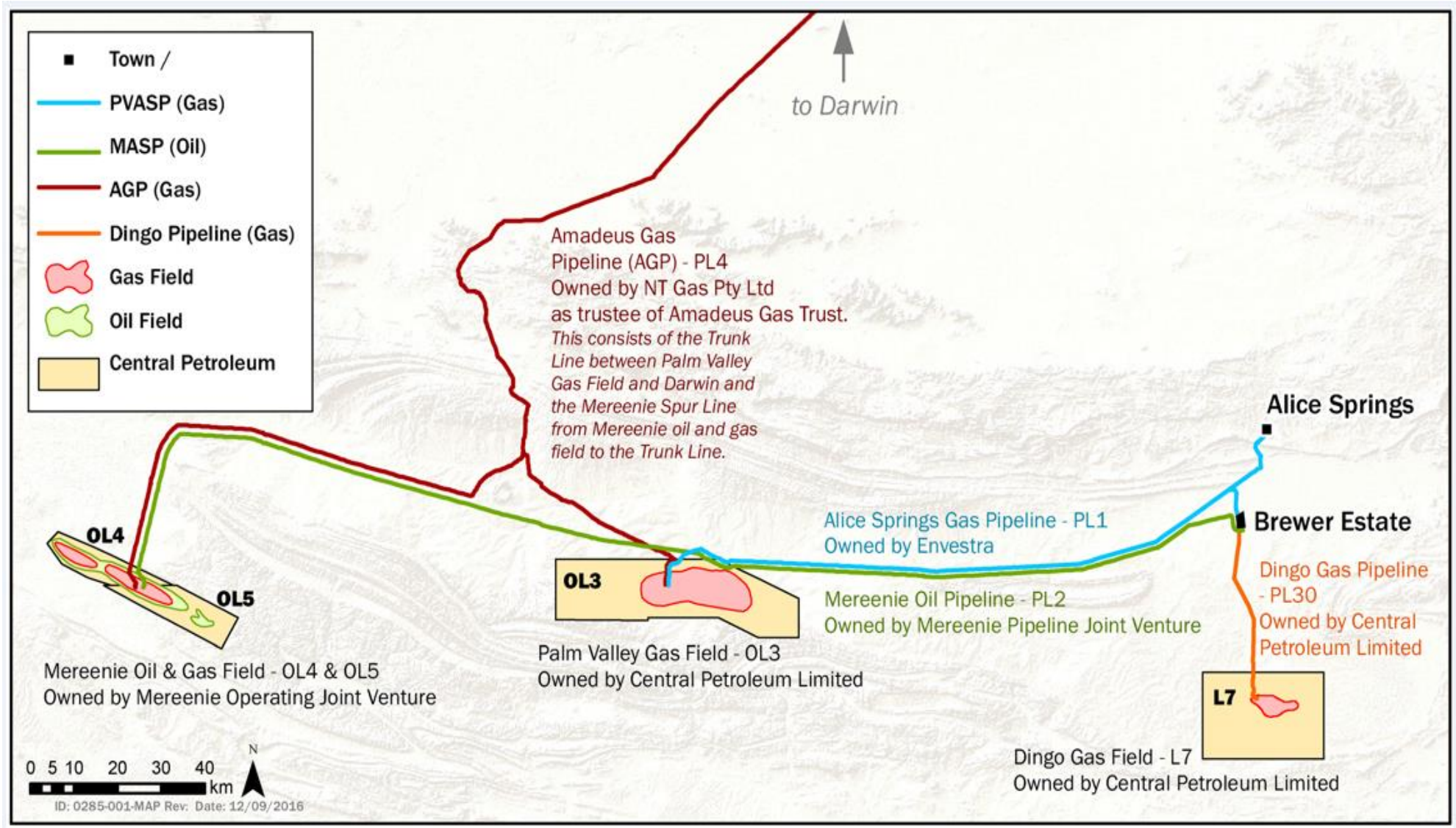

Figure 1-1 Map of general location of the Palm Valley Gas Field

1.3 Proponent

CP is an Australian Securities Exchange (ASX) listed junior exploration and production company registered on the 7th March 2006 under the Corporations Act 2001. CP operates the largest holding of prospective onshore acreage in Australia totalling over 229,000 km^2, c.57 million acres. This acreage includes permits already awarded and acreage under application with 209,000 km^2 under the Petroleum Acts and 20,000 km^2 under the Mining Acts mainly in the Northern Territory with smaller holdings in Western Australia, South Australia and Queensland.

Table 1-1 Central Petroleum Company Details

Company Name	Central Petroleum Limited
ACN/ABN	ABN: 95 009 718 183
Street Address	Level 7/369 Ann Street, Brisbane QLD 4000
Postal Address	PO Box 292 Brisbane, QLD, 4001
Telephone	+61 (0)7 3181 3800
Facsimile	+61 (0)7 3181 3855
Key Contact	Ben Visser – General Manager Operations
Email	info@centralpetroleum.com.au
Website	www.centralpetroleum.com.au

1.4 Purpose

The purpose of this FEMP is to:

- Provide information to the NT Government as required under Section 45 (1) (f) of the *Petroleum Act 2016*;
- Provide additional information as required by the *Petroleum (Environment) Regulations 2016*;
- Provide information to the NT Environment Protection Authority (EPA) to make an assessment under the *Environmental Assessment Act 2013,* if required;
- Communicate environmental aspects, risks, management measures and responsibilities to CP personnel and contractors; and
- Provide a basis for environmental audits of the PVGF.

1.5 Scope

This FEMP covers the normal operational environmental hazards and management measures relevant to PVGF ongoing production activities, conducted by its personnel and contractors hired by CP to work on site. Where activities are outside of the normal production operations (e.g. drilling operations, fracture stimulation, new infrastructure and seismic exploration activities) will be covered by separate Environmental Management Plans (EMPs) developed for assessment by DPIR. The operational activities covered by this FEMP include:

- Civil maintenance including road, track and lease maintenance (including maintenance of existing infrastructure);
- Repair, replacement and maintenance of gathering flowlines and associated equipment (gathering network is above ground (exception is road crossings);
- Produced water management within existing facilities
- Shutdown maintenance activities including cold venting;
- Routine well head maintenance and function testing (not to include the removal if any permanent barriers);
- Routine wireline activities as identified in the approved Reservoir Management Plan (RMP)
- Operations repair and maintenance of existing facilities;
- Pipeline and flow line operations, maintenance and repair including pigging (does not include pipelines as defined under the *Energy Pipelines Act*);

- Maintenance and repairs of existing processing facilities including the direct replacement of obsolete or irreparable equipment
- Grey water and waste water system maintenance;
- Fuel and chemical storage, handling and transportation;
- General waste management;
- Weed control; and
- Maintenance of erosion and sediment controls.

This FEMP does not address general health and safety.

The facilities referenced in the scope are in relation to existing facilities, infrastructure and assets. The scope does not include new construction activities of facilities, new or additional land clearing, new infrastructure or upgrades to existing facilities.

NOTE:

Regardless of the above list, if the environment impacts and/or outcomes posed by an activity are not risk assessed in this FEMP then the activity will not be undertaken.

A revised or separate EMP will be submitted where proposed activities are not covered by the above scope and/or not covered by the FEMP risk assessment. CP will revise and re-submit the FEMP where there is a new or increased environmental risk not covered by the plan (as per Section 17 of the Petroleum (Environment) Regulations).

CP will contact the regulator for advice where it is unclear if proposed activities are covered by the FEMP.

1.5.1 Petroleum Environmental Regulations

Table 1-2 is a document map between this FEMP and required sections of the NT Petroleum (Environmental) Regulations.

Table 1-2 Document map between this FEMP and the NT Petroleum (Environmental) Regulations

Regulations		PVGF FEMP
Schedule 1		
Part 1		
1. Description of Activity	a. Location	Section 1.2
	b. General layout	Figure 6-1
	c. Outline of proposed activities	Section 6.4
	d. Hydraulic fracturing	Section 1.5 (not in scope)
2. Description of the Existing Environment	a. Description of existing environment that may be affected by activities	Section 5
	b. Details of any potential values or sensitivities	Section 5
	c. Identification of knowledge gaps/ uncertainty in relation to the existing environment	Section 5
3. Assessment of Environmental Impacts and Risks		Section 7, Section 8
1. A plan must include:	a. Details of environmental risk and impacts	Section 7, Section 8
	b. Description of methodologies used to determine the risk assessment	Section 7
2. The assessment in subclause (1) must be of:	a. Aspects of activities and emergencies	Section 7, 9
	b. Cumulative effects	Section 7.4

Regulations		PVGF FEMP
4. Environmental Outcomes and Performance Standards	a. Environmental outcomes in relation to the regulated activity	Section 8
	b. Performance standards against which performance against achieving outcomes can be measured	Section 8
	c. Measurement criteria to ensure outcomes and standards are met	Section 8
Part 2 Implementation		Section 9
5. Requirements for the implementation strategy		Section 9.1
6. Details of systems, monitoring, tests etc.		Section 9.4
1. An implementation strategy must provide:	a. Ongoing monitoring and review	Section 9.4.2
	b. Monitoring, audit and review of non-conformance and environmental penalties	Section 9.4.1, 9.4.3 & 9.4.4
2. The implementation strategy must give details of:	a. Specific systems, practices and procedures to ensure outcomes and performance standards are met	Section 8
	b. i) Monitoring of environmental impacts	Section 8
	ii) Monitoring of emissions and discharges	Section 9.4
	iii) Carrying out and recording of the monitoring in an accurate, auditable way.	Section 9.4
	iv) Test of equipment to carry out monitoring and interval of testing	Any testing to be carried out by third party suitable qualified consultant.
7. Personnel	a. Clear chain of command including during emergencies	Section 9.2
	b. Roles and responsibilities of personnel in relation to implementation, management and review of the FEMP.	Section 9.2
	c. Each employee/contractor is aware of their responsibilities to the FEMP and has appropriate competences and training	Section 9.2 & 9.3
8. Emergency Contingency Plan	a. Specifies arrangements for emergency	Section 9.5
	b. Provision for implementation of plan	Section 9.5
Part 3 Other Matters		
9. Stakeholders		Section 12
1. Engagement	a. List of stakeholders	Section 12.6
	b. Copy of information provided from stakeholder engagement	Appendix 4 & 5
	c. Summary of any matters discussed	Section 12.7
	d. Assessment of merit of an objection or claim	Section 12.8
	e. Statement of intent holder's response	Section 12.9
	f. Record of communication	Appendix 5
	g. Details of changes due to engagement	Section 12.10
2. Future engagement plans		Section 12.11

Regulations		PVGF FEMP
10. Legislative Requirements	a. Specify any legislative requirements	Section 4
	b. Outline how these will be met	Table 4.1
11. Recording, Monitoring and Reporting		Section 8, 9.4, 9.6 & 10
1. A plan must specify arrangements for:	a. Arrangements for recording monitoring and reporting the details of information about the regulated activity so that the Minister can see the environmental outcomes and performance standards are being met	Section 9.4, 9.6 & 10
	b. Interval of reporting (at least annually)	Table 10-1
2. All reports in the FEMP plus any other law in force in the NT need to be recorded		Section 10
12. Before Drilling, Seismic or Construction that is not civil maintenance, inform	• The minister	NA - Separate EMP developed
	• Occupant of land	NA - Separate EMP developed
	• Owner of land	NA – Separate EMP developed

1.6 Objectives

CP has a strong commitment to the development of and adherence to environmental work practices. This FEMP has been written to increase environmental awareness and improve environmental management at the PVGF with the following objectives:

- Identify environmental sensitivities of the OL3 area;
- Identify the potential environmental risks and impacts of the PVGF operations; and
- Describe the management systems that will be implemented to ensure the environmental risks are adequately assessed, appropriately managed and checked to maintain management of environmental risks to “as low as reasonably possible” (ALARP).

2 DOCUMENT CONTROL

DISCLAIMER

This is a Central Petroleum Limited (CP) document and it has been prepared using the skill and care expected from professional scientists to provide factual and technical information and reasonable solutions to identified risks.

Document Ownership and Revision

CP is the custodian of this FEMP and has overall responsibility for its implementation, compliance and revision.

CP will ensure that this FEMP is reviewed and revised:

- When there is a significant change to normal operations at the PVGF not covered by this FEMP;
- When there is a significant change to the regulatory framework within which the operations are carried out;
- When recommendations or comments from the government approval process are made;
- If there is a change in circumstances (e.g. a new or increase in environmental impact or risk)
- In the event an incident causing significant environmental harm or loss occurs; or
- Five yearly after acceptance, unless superseded by another plan.

This document shall not be issued and/or revised without the express approval of the CP General Manager of Operations. Likewise, any amendments to this document shall be checked and approved by the CP General Manager of Operations.

DOCUMENT DETAILS

Table 2-1 Document Details

Document Number:	PVL-650-PLN-0001
Name of Document:	Palm Valley Gas Field: Field Environmental Management Plan
Authors:	• Low Ecological Services & • Enviro-Value Pty Ltd.
Client:	Central Petroleum
Name of Project:	Palm Valley Gas Field – OL3 FEMP

DOCUMENT CONTROL

Table 2-2 Document Control

Approvals	Company	Name	Signature	Date
Author:	Low Ecological Services	Bill Low		**06/12/18**
Reviewer:	Enviro Value	Rob Ully		**06/12/18**
Approver:	Department of Primary Industry and Resources			
Custodian:	**Central Petroleum Limited**	**Ben Visser**		**10/01/19**

REVISION DETAILS

Table 2-3 Revision Details

Date	Revision	Details	Comments
07/09/16	Draft 1	For comment	Draft FEMP for comment under the new regulations
22/02/18	Final V1	For submission	FEMP formally submitted for review
17/04/18	Final V2	For submission	Revised FEMP based on comments from DPIR
04/10/18	Final V3	For submission	Revised FEMP based on comments from DPIR
08/11/18	Final V4	For submission	Revised based on feedback from DPIR on the PV EMP Bridging Document.
12/12/18	Final V5	For submission	Revised based on feedback from DENR and DPIR
11/01/19	Final V6	For submission	Revised based on feedback from DENR and DPIR

Glossary of Terms

AAPA	Aboriginal Areas Protection Authority
AEP	Annual Exceedance Probability
AGP	Amadeus Gas Pipeline
ALARP	As Low as Reasonably Possible
APIA	Australian Pipeline Industry Association
APPEA	Australia Petroleum Production and Exploration Association
ARI	Average Recurrence Interval
AS2885	Australian Standard Pipelines – gas and liquid petroleum - design and construction
ASX	Australian Securities Exchange
CCS	Central Compression Station
CTP	Central Treatment Plant
CLC	Central Land Council
CP	Central Petroleum Limited
CSM	Conceptual Site Model
DENR	Department of Environment and Natural Resources (formerly land resource management)
DOEE	Department of the Environment and Energy
DPIR	Department of Primary Industry and Resources
EIS	Environmental Impact Statement
EPBC ACT	*Environment Protection and Biodiversity Conservation Act (c'wlth)*
EMM	Environmental Management Manual
EMP	Environmental Management Plan
ECSD	Ecological Sustainable Development
ERA	Environmental Risk Assessment
ESD	Emergency Shut Down
FEMP	Field Environmental Management Plan
HCGR	Hazardous Chemical Goods Register
HP	Horse Power
HS&E	Health, Safety and Environment
HS&E MS	Health, Safety and Environmental Management System
IBRA	Interim Biogeographic Regionalisation of Australia
IECA	International Erosion Control Association
JHA	Job Hazard Analysis
LES	Low Ecological Services
MAOP	Maximum Allowable Operating Pressure
MNR	Mereenie Oil and Gas Field
NAFI	Northern Australian Fire Information
NGERS	National Greenhouse and Energy Reporting
NOI	Notice of Intent

NORM	Naturally Occurring Radioactive Material
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
OL	Operating Licence
OPSMAN	Operations Manual
P&A	Plugged and Abandoned
PER	Public Environment Report
PFESA	Police Fire and Emergency Services
PMSR	Protected Matters Search Report
PPM	PVGF Photographic Point Monitoring
PV	Palm Valley
PVC	Polyvinyl Chloride
PVGF	Palm Valley Gas Field
PVGSPA	Gas Supply and Purchase Agreement
PWC	Power and Water Corporation
RCCA	Registering and Closeout of Correcting Actions
SCADA	Supervisory Control and Data Acquisition
SDS	Safety Data Sheet
SoBS	Site of Botanical Significance
SoCS	Site of Conservation Significance
SSV	Surface Safety Valve
SWL	Static water level
TOs	Traditional Owners
TPH	Total Petroleum Hydrocarbons
TPWC ACT	*Territory Parks and Wildlife Conservation Act*
WoNS	Weed of National Significance

3 CORPORATE ENVIRONMENTAL POLICY

3.1 Central Petroleum's commitment to the environment

CP has a high standard of environmental responsibility implemented through operational quality and integrity measures above and beyond industry standards. CP has a strong environmental commitment focus through all its facilities and operations, being at the forefront of policy and management strategy developments. This FEMP has been compiled in keeping with CP's environmental policy and operational activities and developed mitigation and preventative measures and standards to ensure the operation of the PVGF within the OL3 area has the smallest ecological footprint and impact as possible. The employees and contractors of CP, both office and field, have been briefed on the company's policy, standards and expectations.

CP corporate environmental policy is provided in Figure 3-1 and the corporate HSSE policy is provided in Figure 3-2.

Central Petroleum Limited

CENTRAL PETROLEUM LTD
ENVIRONMENTAL PROTECTION POLICY

Central Petroleum Limited considers protection of the natural and social environment to be of the highest priority in all its activities, both domestic and international, and conducting its operations in an environmentally responsible manner.

It is Central Petroleum's policy to:

- Comply, at a minimum, with applicable laws, regulations, standards, codes and guidelines for the protection of the environment and cultural heritage, and in their absence, adopt the best practicable means to prevent or minimise adverse environmental and cultural heritage impacts;
- Cooperate with governments and industry in the formulation of rational and practical environmental and cultural heritage guidelines and legislation;
- Continuously develop the company's environmental management system and cultural heritage management plans to identify, control and monitor risks and compliance with government regulations and industry guidelines, utilising the most appropriate technology available;
- Commit all levels of management to accept responsibility for environmental and cultural heritage management in all Central Petroleum activities;
- Promote environmental and cultural heritage awareness in all Central Petroleum employees and contractors through induction and training programs;
- Maintain cooperative and positive relationships with indigenous people with custodial responsibility for the land where Central Petroleum operates to minimise the impact of those operations on the cultural heritage of the indigenous people, and cooperate with other legitimate land users so that, where appropriate, multiple land use is possible;
- Conduct all Company operations in such a way as to minimise disturbance to the environment, protect native flora and fauna, avoid the pollution of land, water and air, and avoid disturbance of known sites of archaeological, cultural heritage, historical, natural or scientific significance; and
- Maintain an active rehabilitation program that will restore operational areas to a condition which is compatible with the prior land use.

Richard Cottee
Managing Director
6th March 2018

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Figure 3-1 CP's corporate environmental policy

Central Petroleum Limited

CENTRAL PETROLEUM LTD
HSSE POLICY

Central Petroleum Limited believes that effective management of Health, Safety, Security and Environmental (HSSE) issues is essential for success in its business, by:

- Providing leadership and commitment to HSE issues and communicating our expectations to employees, contractors and other stakeholders;
- Providing clear direction and monitoring of a zero drug and alcohol tolerance to all contractors and employees whilst involved in drilling, seismic or production activities (Operations) on site or when binding decisions relevant to Operations are required to be made;
- Zero tolerance to smoking in any workplace, except designated areas;
- Complying with national, state and local legislation;
- Providing a safe working environment for all employees, contractors and third party personnel;
- Minimising the impact of our activities on the environment;
- Selecting and managing contractors to ensure their HSE performance meets our and statutory requirements;
- Carrying out risk assessments and taking effective measures to reduce risks to as low as reasonably practicable on all our operations;
- Providing sufficient training, resources, equipment and personnel to achieve our HSE objectives;
- Maintaining appropriate HSE documentation;
- Monitoring HSE performance-investigating and reporting all incidents and accidents regularly to the Board of Directors as well as relevant authorities;
- Striving for continuous improvement;
- Ensuring effective emergency response procedures are in place;
- Supporting wherever possible the advancement of local communities in areas where we operate; and
- Conducting audits and reviews to assess compliance with this policy.
- Implementing and using management systems for integrity management of plant, pipelines and equipment.

It is the responsibility of all employees and contractors to comply with this policy and to assist Central Petroleum Limited in its implementation.

Richard Cottee
Managing Director
6th March 2018

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Figure 3-2 CP's corporate HSSE policy

4 ENVIRONMENTAL LEGISLATION AND OTHER REQUIREMENTS

Central Petroleum understands the Legislation required to operate the PVGF, below lists the key pieces of legislation relevant to the operation of the PVGF:

Description	Legislation / Title
Commonwealth	*Aboriginal Land Rights (Northern Territory) Act 1976* *Native Title Act 1993* *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* *National Environmental Protection Council Act 1994* *National Greenhouse and Energy Reporting Act 2007* *Australian Heritage Council Act 2003* *Environmental Protection and Biodiversity Conservation Act 1999*
Northern Territory	*Aboriginal Land Act 2013* *Work Health and Safety (National Uniform Legislation) Act 2016* *Public and Environmental Health Regulations 2018* *Plant Health Act 2015* *Petroleum (Prospecting and Mining) Regulations (repealed)* *Biological Control Act 2018* *Northern Territory Aboriginal Sacred Sites Act 2013* *Bushfires Management Act 2016* *Control of Roads Act 2018* *Dangerous Goods Act 2012* *Energy Pipelines Act 2015* *Environmental Assessment Act 2013* *Environmental Offences and Penalties Act 2011* *Fire and Emergency Act 2016* *Heritage Act 2016* *Petroleum (Environmental) Regulations 2016* *Petroleum Act 2016* *Public and Environmental Health Act 2016* *Public and Environmental Health Regulations 2018* *Schedule of Onshore Petroleum Exploration and Production Requirements 2016* (under the *Petroleum Act 2016*) *Soil Conservation and Land Utilisation Act 2016* *Parks and Wildlife Commission Act 2013* *Territory Parks and Wildlife Act 2014* *Waste Management and Pollution Control Act 2016* *Water Act 2016* *Weeds Management Act 2013*
Operating Consents	OL3
Other Regulatory Instruments	Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice, October 2008 Schedule of Onshore Petroleum Exploration and Production Requirements 2017 AS2885: Pipelines – Liquid Petroleum and Gas American Society of Mechanical Engineers B31.3 Process Piping Code (ASME B31.3) Australian Pipeline Industry Association (APIA) Code of Environmental Practice – Onshore Pipelines, October 2013 National Environment Protection (Assessment of Contaminated Sites) Measure 1999 National Environment Protection (Movement of Controlled Wastes between States and Territories) Measure 1998 National Environment Protection (National Pollution Inventory) Measure 1998 AAPA Land Access Agreements Approval and Certificates

Other References (Non-regulatory)	ICEA Best Practice Erosion and Sediment Control Guidelines Risk Assessment Standards AS/NZS ISO 31000:2009 and HB 203:2006 Central Petroleum MSTD09-01 v1 – Hazard Identification, Risk Management and Control Central Petroleum Central Petroleum Environmental Protection Policy 2016
Codes of Practice	Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice (2008)

4.1 Summary of Legislative Requirements

A summary of legislative requirements and CP's actions and intent for each are provided in Table 4-1.

Table 4-1 Summary of Legislative Requirement.

Legislative Requirement	Relevant Legislation	Administrator	Proposed Actions
Production Licence	*Petroleum (Prospecting and Mining) Regulations (repealed)*	DPIR	Field operated under OL3
Notice of Intent and Formal Environmental Assessment	*Environmental Assessments Act* and Administrative Procedures	NT EPA	This FEMP does not constitute any material change of use. CP therefore considers it unnecessary to refer the operations for assessment. Refer to Section 4.1.1.
Minister's approval	*Environment Protection and Biodiversity Conservation Act*	DOEE	CP does not consider the scope of the FEMP for the operations of PVGF is likely to have any significant impacts on matters of national environmental significance and will not be referring the operations for assessment at this stage. Refer to 12.3.2 and Appendix 3.
Must not enter, damage or interfere with a Sacred Site (even if not registered)	*Northern Territory Aboriginal Sacred Sites Act*	CLC	CP obtained a CLC Sacred Site Clearance Certificate (C2015-035) for the PVGF operations.
Work approval (for removal or damage of archaeological sites)	*Heritage Act*	DENR	All operations proposed in this FEMP will be conducted in existing disturbed areas, therefore CP do not anticipate a work approval will be required.
Underground Waste Disposal Licence	*Water Act* Part 6 Division 5	DENR	CP has approval to reinject produced water into PV-04 well (Appendix 2). Reinjection may provide enhanced sustainability of the field by increasing production rates and prolonging the life of the field
Surface Water Extraction Licence	*Water Act* Part 5 Division 2	DENR	Subject to Section 7 (3) – Licence is not required for petroleum activities and is managed under the Petroleum Act and Petroleum (Environment) Regulations
Groundwater Extraction Licence	*Water Act* Part 6 Division 4	DENR	Subject to Section 7 (3) – Licence is not required for petroleum activities and is managed under the Petroleum Act and Petroleum (Environment) Regulations
Construct or Alter Works approval (dams/interference with a waterway or	*Water Act*	DENR	Subject to Section 7 (3) – Licence is not required for petroleum activities and is managed under the Petroleum Act and Petroleum

roadworks)			(Environment) Regulations
Reporting under National Greenhouse and Energy Reporting Scheme	*National Greenhouse and Energy Reporting Act*	Australian Government - Clean Energy Regulator	CP is obligated and registered to report under the scheme
Dangerous Goods Business Licence	*Dangerous Goods Act*	NT Worksafe	CP will ensure licence is held by CP or contractor if applicable
Dangerous Goods Vehicle Licence	*Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act*	NT Worksafe	CP will ensure licence is held by CP or contractor if applicable
Poisons Licence	*Poisons and Dangerous Drugs Act*	Dep't of Health	CP will ensure licence is held by CP or contractor if applicable
Complying to new legislation	*Code of Practise for Petroleum Well Operations in the Norther Territory* *Schedule of petroleum exploration and production requirements*	DENR	CP will endeavour to comply to any new legislation where applicable

4.1.1 Environmental Assessment Act

Under the Environmental Assessment Act, proposed projects that may have a significant effect on the environment are to be referred to the NT EPA for assessment. CP has conducted a self-assessment using the NT EPA Guideline Referring a Proposal to the NT EPA (2018). The assessment is based on consideration of the potential impacts of the activities on environmental factors and objectives as outlined in the guideline.

The evaluation in Table 4-2 shows that the activities do not pose any significant impacts or risks to the environment. The works are being carried out on previously disturbed area designated for petroleum activities and all the risks have been highlighted within this FEMP and are managed to ALARP. CP has determined that the activities for the PVGF operations covered by this FEMP do not trigger referral to the NT EPA under the guidelines as issued (NT EPA, 2014; see Legislation above).

Table 4-2 Environmental Factors and Objectives Assessment

Aspects	Environmental Factor	Objectives	Impacts and Mitigation Measures
LAND	*Terrestrial Flora and Fauna*	No significant impact to conservation significant fauna No significant impact to conservation significant fauna habitat No significant impact to conservation significant flora	The operational activities under this FEMP are unlikely to result in significant impacts to terrestrial flora and fauna given the existing operational footprint will not be increased, petroleum activities will operate as previously approved land use and management measures are in place. Risks to fauna has been assessed as Low (Section 7) due to the sensitive nature of the surrounding environment and the detection of some fauna species of conservation significance within the PVGF (Section 5.1.13). Tight controls are to be implemented to ensure risks are reduced to meet conservation requirements (Section 7). The PVGF operational activities are unlikely to impact any area or species of flora of conservation significance as no species have been recorded in or adjacent to the operational areas (Section 5.1.11) and the works do not involve clearing of regulated vegetation. There are no listed threatened ecological communities within the PVGF operational areas and the area including Palm Valley palm and cycads are outside any areas of potential impact (Appendix 3). The PVGF is located within the Greater MacDonnell Ranges Site of Conservation Significance (Section 5.1.3) and Finke Gorge National Park. Potential impacts to the Site of Conservation Significance or National Park are considered to be unlikely as the operational activities will be conducted on an existing footprint and management measures are in place to protect flora and fauna, habitat and surface and groundwater resources (refer to Section 8). The PVGF is located within the Palm Valley Site of Botanical Significance (Section 5.1.3). Potential impacts to the Palm Valley Site of Botanical Significance is considered unlikely as the operational activities will be conducted on an existing footprint and management measures are in place (refer to Section 7). Weeds are actively managed within the operational areas. Biosecurity risks are considered low with management measures in place (Section 7).
	Terrestrial Environmental Quality	No significant impact to terrestrial environmental quality	Impacts to terrestrial environmental quality will not change given activities conducted under this FEMP are to take place within the existing footprint. Management measures are in place to manage risks of weed infestations, bushfires, flooding, waste and contamination (Section 7).
	Landforms	No erosion and sedimentation No significant impact to landforms upon completion of decommissioning and rehabilitation	The operational activities will not require land disturbance beyond the existing footprint. Erosion potential for the skeletal sandy soils in the PVGF area are low to moderate (Section 5.1.7) and readily controlled by run-off control techniques. Risks to soils and landform have been classified as low (Section 7) with management measures in place (Section 7).

Aspects	Environmental Factor	Objectives	Impacts and Mitigation Measures
			Decommissioning and rehabilitation measures are to be instigated for areas no longer in use (Section 7) with the objective of returning the landform to its original contours where possible.
WATER	*Hydrological processes (Groundwater and Surface water)*	No degradation to surface water quality or drainage No detrimental impact to groundwater dependant ecosystems	The PVGF operational activities are unlikely to impact on ground or surface water hydraulic processes as works are to be conducted within the existing footprint and site are to be rehabilitated to the pre-existing landform. Activities are to avoid waterways and manage any erosion and sedimentation issues that may arise, noting that generally the area has a low to medium erosion potential. Risks to hydraulic processes are considered low (Section 7) with management measures in place (Section 7). The main risk to groundwater water quality is asset integrity failure (e.g. well casing failure). The risk of asset integrity failure is considered moderate (Section 7) however tight controls (e.g. continuous pressure monitoring, aquifer reinjection into confined system, rigorous maintenance, inspection, monitoring and testing regimes, contamination response procedures) are in place to manage this risk to ALARP (Section7).
	Inland Water Environmental Quality	No degradation to groundwater quality No loss of groundwater amenity to surrounding users	
AIR	*Air Quality and Greenhouse Gases*	No deterioration to air quality due to operational activities Minimisation of greenhouse gases emissions	The risks to air quality from the PVGF operations are considered low (Section 7) given the isolated location of the field away from sensitive receptors (Section 5.2.2) and the management measures in place (Section 7). Greenhouse gas emissions are considered to be low risk (Section 7) with management measures in place such as routine maintenance of plant and equipment (Section 7).
PEOPLE AND COMMUNITIES	*Social, Economic and Cultural Surroundings*	No unauthorised disturbance to identified cultural and heritage significant sites and/or objects No nuisance complaints from sensitive receptors Minimise impact and improve livelihood of local communities	There are no publicly listed heritage sites within the PVGF area (Section 5.2.3). The area has been previously surveyed and does not contain any significant archaeological materials (Section 5.2.5). Central Petroleum has a current CLC Sacred Site Clearance Certificate for the existing operations on OL3 (C2015-035). No additional site clearance is required as all activities under this FEMP will be conducted within the existing footprint. Annual meetings with traditional owners of the site to explore community perceptions and interactions. Nuisance risks to people and communities are considered low (Section 7). Nuisance impacts from the PVGF are unlikely given its location away from populated areas and management measures in place for traffic, noise, light and visual amenity (Section 7). Economically, CP aims to employ local and indigenous personnel where possible to contribute to the economic stability of the area (Section 7).

5 DESCRIPTION OF ENVIRONMENT

5.1 Physical Environment

5.1.1 Climate

The climate of the PVGF area is described by Slatyer (1962) as semi-arid with 70% of precipitation occurring between October and March; caused mainly by monsoonal depression systems in northern Australia.

Climatic conditions for Alice Springs and Hermannsburg are shown in Figure 5-1. Mean annual rainfall is 234.6 mm and is highly variable. Summer temperatures are high with an average maximum of 34.9ºC and with winter monthly maximum temperatures average 20ºC; with frosts occurring between June and August (Bureau of Meteorology, 2015).

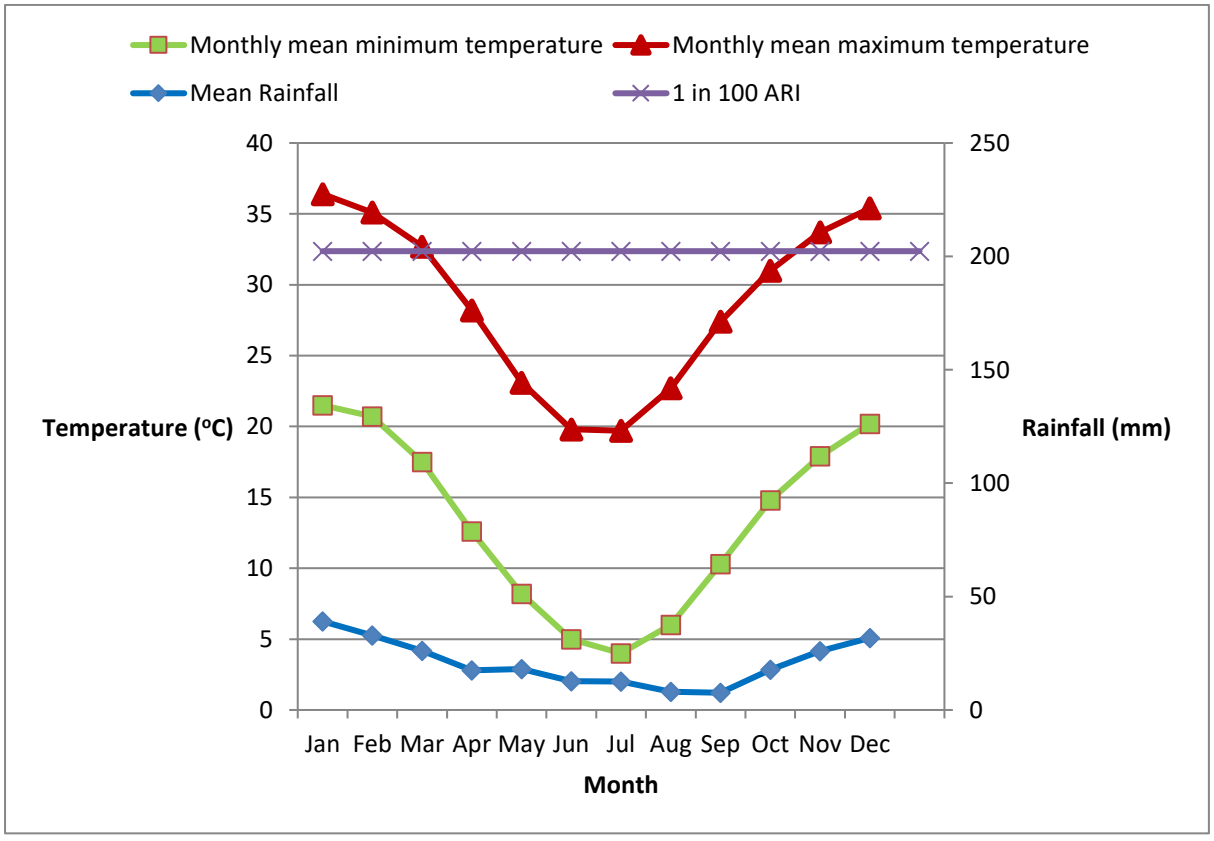


Figure 5-1 Alice Springs (1942-2015) weather data showing mean highest and lowest monthly temperatures and Hermannsburg (1888-2015) mean monthly rainfall; with 1 in 100-year rainfall event for freeboard calculations.

Table 5-1 shows the Annual Exceedance Probability (AEP) for various storm event durations at the PVGF. The 1 in 100-year Average Recurrence Interval (ARI) storm event is the same as the 1% AEP, so for a 24-hour storm event the 1 in 100-year ARI is 202.3 mm. This value is used for freeboard engineering considerations on evaporation ponds and other open-air water structures.

Table 5-1 AEP tables for Storm Durations at the PVGF

	AEP [Values in mm of rainfall for each duration and AEP]						
Duration	**100%**	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
1 min	1.6	1.9	2.9	3.6	4.3	5.4	6.2
2 min	2.8	3.3	5.1	6.4	7.7	9.6	11.2
3 min	3.8	4.6	7.0	8.8	10.6	13.3	15.5
4 min	4.8	5.7	8.7	10.9	13.2	16.5	19.1
5 min	5.6	6.7	10.2	12.8	15.5	19.3	22.3
10 min	8.8	10.5	16.0	20.0	24.1	29.8	34.5
15 min	11.0	13.1	19.9	24.9	30.0	37.2	43.0
30 min	15.0	17.9	27.3	34.1	41.2	51.1	59.2
1 hour	19.3	22.9	35.0	43.8	53.0	66.1	76.7
2 hours	23.8	28.2	43.1	54.1	65.6	82.0	95.6
3 hours	26.7	31.6	48.3	60.6	73.6	92.1	107.5
6 hours	32.6	38.6	58.9	73.9	89.7	112.2	130.8
12 hours	40.3	47.8	73.0	91.6	110.9	138.4	161.0
24 hours	50.1	59.9	92.2	115.8	140.1	174.4	202.3
48 hours	61.5	74.2	116.4	147.0	178.6	223.0	259.1
72 hours	67.7	82.3	131.0	166.8	204.0	256.6	299.7
96 hours	71.3	87.0	140.2	179.8	221.4	281.2	330.8
120 hours	73.2	89.5	145.6	188.1	233.4	299.5	355.1
144 hours	74.0	90.6	148.5	193.1	241.4	313.0	374.3
168 hours	74.0	90.7	149.4	195.7	246.4	322.9	389.4

5.1.2 Bioregion

The OL3 area is located in the MacDonnell Ranges Bioregion as classified by (Baker, et al., 2005) shown in Figure 5-2 and described in Table 5-2. The bioregion covers 39,294 square kilometres of which 10-15% is protected within reserves.

This bioregion in the NT contains the highest number of species listed with conservation status nationally or locally. It includes the small but nationally significant Finke River headwater gorge system (10ha); an important set of perennial waterholes in rugged ranges (Baker, et al., 2005). This headwater gorge system lies outside and upstream of the PVGF area.

The soils in this bioregion located at the PVGF are dominated by shallow soils on rocky hills, having a low to moderate erosion potential. Mitigation measures described in this FEMP detail the management of this erosion risk.

Table 5-2 Description of Bioregion/s of the OL3 Area (Baker, et al., 2005)

Extent in OL3 area	Bioregion	Topography	Geology	Soils	Vegetation
100%	MacDonnell Ranges	High relief ranges and foothills	Mostly sedimentary rocks in the Amadeus Basin	Generally skeletal or shallow sands on the rocky hills, with earthy sands and deep loamy alluvium on the lowlands	Dominant vegetation spinifex hummock grassland, sparse acacia shrub lands and woodlands along watercourses

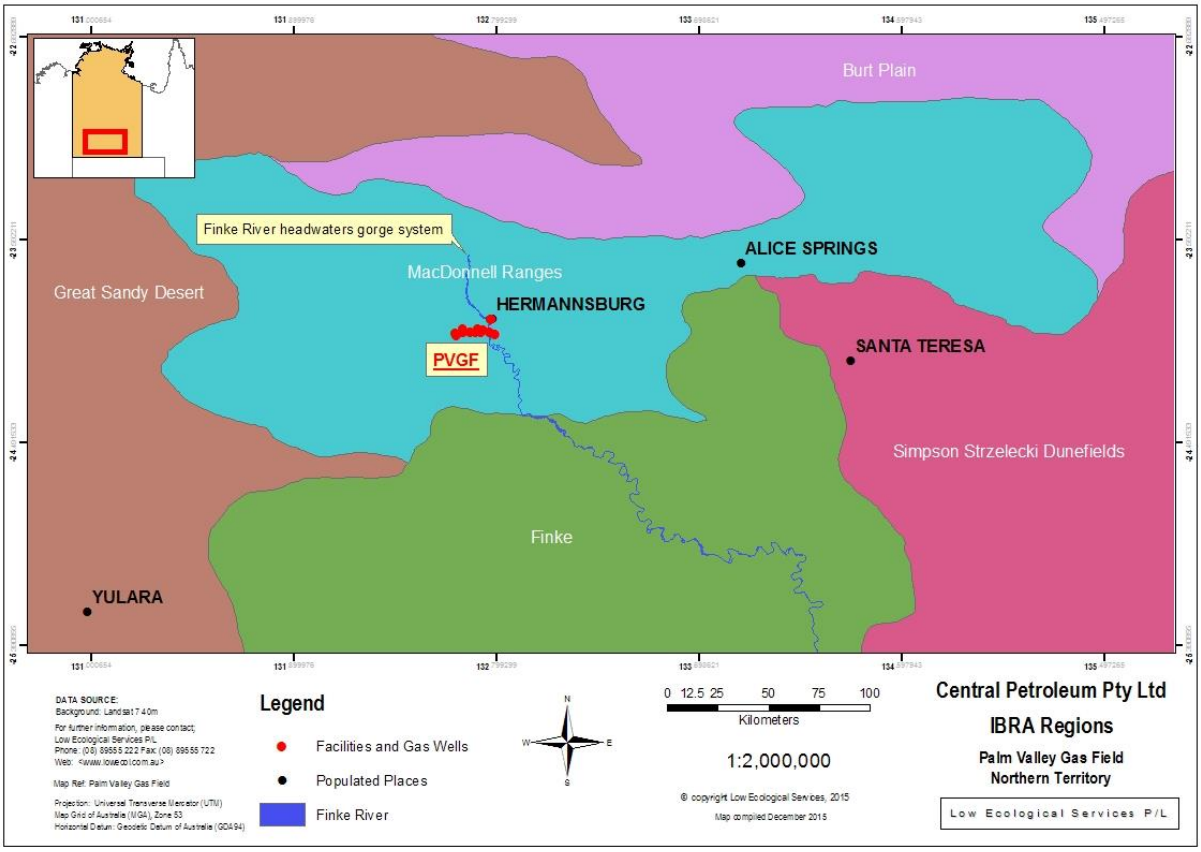


Figure 5-2 Shows the extent of the MacDonnell Ranges bioregions compared to the PVGF area (Baker, et al., 2005)

5.1.3 Sites of Conservation Significance

The OL3 area is located within the Greater MacDonnell Ranges Site of Conservation Significance (SoCS) which covers an area of 31,395 km^2 in the NT. The SoCS is rated as Internationally Significant and has high ecological value based on the number of threatened and endemic species, particularly short-range endemics and the permanent water sources which act as habitat refuges. SoCS do not have specific legislation attached at this stage but are recognised as important areas.

The PVGF area is also within a Site of Botanical Significance (SoBS), Palm Valley. The Palm Valley SOBS is regarded as nationally important due to the number of species of conservation significance and endemic species in the area. Flora and fauna surveys in the OL3 area conducted by LES since it was operated by Magellan Petroleum Ltd; including approximately 16 years of quarterly environmental surveys, have not identified any species of conservation significance within impact distance from the PVGF.

The risk assessment in Section 7 identifies all activities at the PVGF that may impact the environmental significance of these SoBS and SoCS. Mitigation measures to reduce these risks are provided in Section 8.

5.1.4 Finke Gorge National Park

On the 7th of June 2011 the land held under title Finke Gorge National Park was transferred to the Lhere Pirnte Aboriginal Land Trust to be held on trust for the Traditional Owners (TOs). The park was then leased back to the Northern Territory Government on a 99-year lease to be jointly managed as a national park. The three main values and conservation management objectives of the park are to:

- Conserve the Indigenous and non-Indigenous cultural and heritage values of the park; and to continue this living culture into the future.
- Conserve the unique flora, fauna and habitats of the area; and
- Allow access for four-wheel drive enthusiasts and tourism in such a way to protect people safety, maximise enjoyment, while preserving the integrity of the Park for future generations (Parks and Wildlife Services of the Northern Territory, 2011).

5.1.5 Land Systems

The OL3 area is predominantly located in the Krichauff land system and all of the operational areas are in this land system, with small portions of Amulda, Muller and Simpson land systems in the north eastern and north western corners of the lease. A broad scale mapping is shown in Figure 5-3, a description of the land system is in Table 5-3 (Perry, et al., 1962). All current operations in the gas field fall within the Krichauff land system. This land system has a moderate erosion risk. It is further broken up into seven sub-sections as described in Table 5-4. An update of Land System mapping of the area was undertaken by DPIR and termed the Southern Land System Mapping. The areas mapped as land systems did not change in the region of the Krichauff Range and the operational areas of the OL3 are all within “Sandstone Hills”.

Table 5-3 Description of Land Systems in the OL3 Area (Perry, et al., 1962)

Extent in OL3 area	Land System	Class Descriptions	Erosion Hazard	Southern Land System classification
3.3%	Amulda	Alluvial floodplains, swamps, drainage depressions and alluvial fans; sandy, silty and clay soils on Quaternary alluvium.	High erosion hazard	Alluvial Floodplains
79.8%	Krichauff	Low hills, hill and stony plateaux on sandstone, siltstone, quartzite and conglomerate (deeply weathered in places); outcrop with shallow stony soils	Moderate erosion hazard	Sandstone Hills

Extent in OL3 area	Land System	Class Descriptions	Erosion Hazard	Southern Land System classification
1.2%	Muller	Plains, rises and plateaux on weathered and unweathered Cambrian limestone, dolomite, chalcedony, shale, sandstone and siltstone with associated sand sheets, sandy and earth soils	Moderate erosion hazard	Limestone Plains and Rises
15.6%	Simpson	Dunefields with parallel linear dunes, reticulate dunes and irregular or aligned short dunes, red sands	Low erosion hazard	Desert Dunefields

Finer scaled mapping was developed by Parks and Wildlife within the Finke Gorge National Park by Andrew Schubert who also carried out land unit mapping for the PVGF with the aim of consistency with the Parks and Wildlife mapping (Ghee & Low, 2007). This land unit mapping of the PVGF area is shown in Figure 5-4. For a full detailed explanation of each land unit in Figure 5-4 see Appendix 6 Parks and Wildlife Biophysical Mapping - Vegetation Units by Schubert

No other fine scale mapping resources are available for the project area. Any future applications for proposed development within the lease area will be accompanied by an activity specific Environment Management Plan incorporating on-ground fine-scaled characterisation of land resources and suitability assessment in specific development areas incorporating Schubert's fine scale mapping if appropriate.

Table 5-4 Sub-section Description of Krichauff Land System

Land Units (Sub-sections)	Land Form	Soil
1	Un-dissected inner plateau surfaces; gentle regional slopes; irregular in detail, with minor structural terraces, deep jointed clefts, and much rock outcrop.	Outcrop with very little shallow stony soil.
2	Dissected plateau margins; flat-crested plateau remnants, spurs and buttes; indented escarpments with rock faces, structural benches and gullied hill slopes, above 25%.	
3	Erosional slopes: 1-5 %, at the foot of unit 2.	Shallow, stony soils.
4	Upland basins; of structural origin up to 1.6 km in extent, and commonly with centripetal drainage. Not present in PVGF.	Stony or gravelly soils and red sands or clayey sands.
5	Colluvial aprons; dissected stony slopes, 1-10%, up to 185 m long.	
6	Narrow valley floors of major, though going drainage; sand and gravel surfaces with rock bars.	
7	Channels; up to 45 m wide; narrowly incised upper sectors with irregular gradients, and shallower, braiding lower reaches.	Bed-loads of ill-sorted materials, ranging from course sand to boulders with rock outcrop, particularly in upper sectors

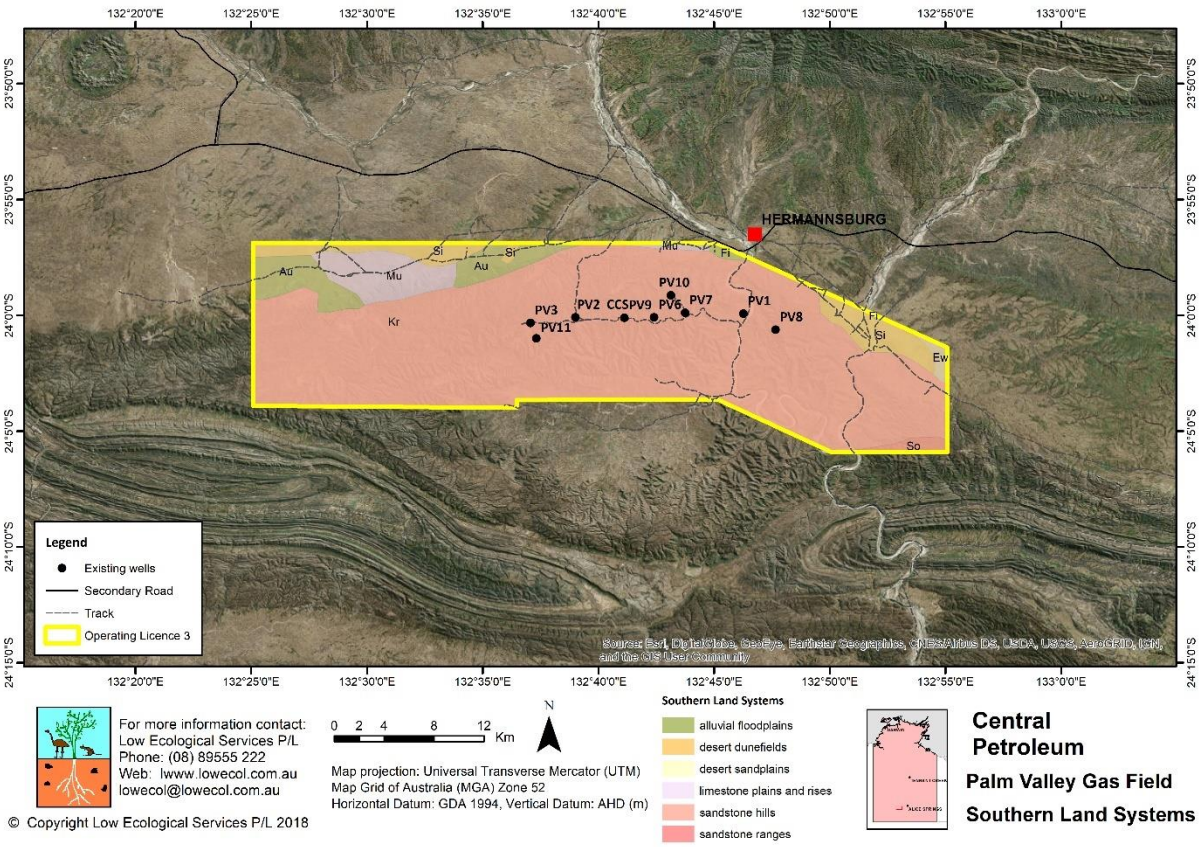


Figure 5-3. Broad scale land system mapping of the OL3 area by Southern Land System Mapping.

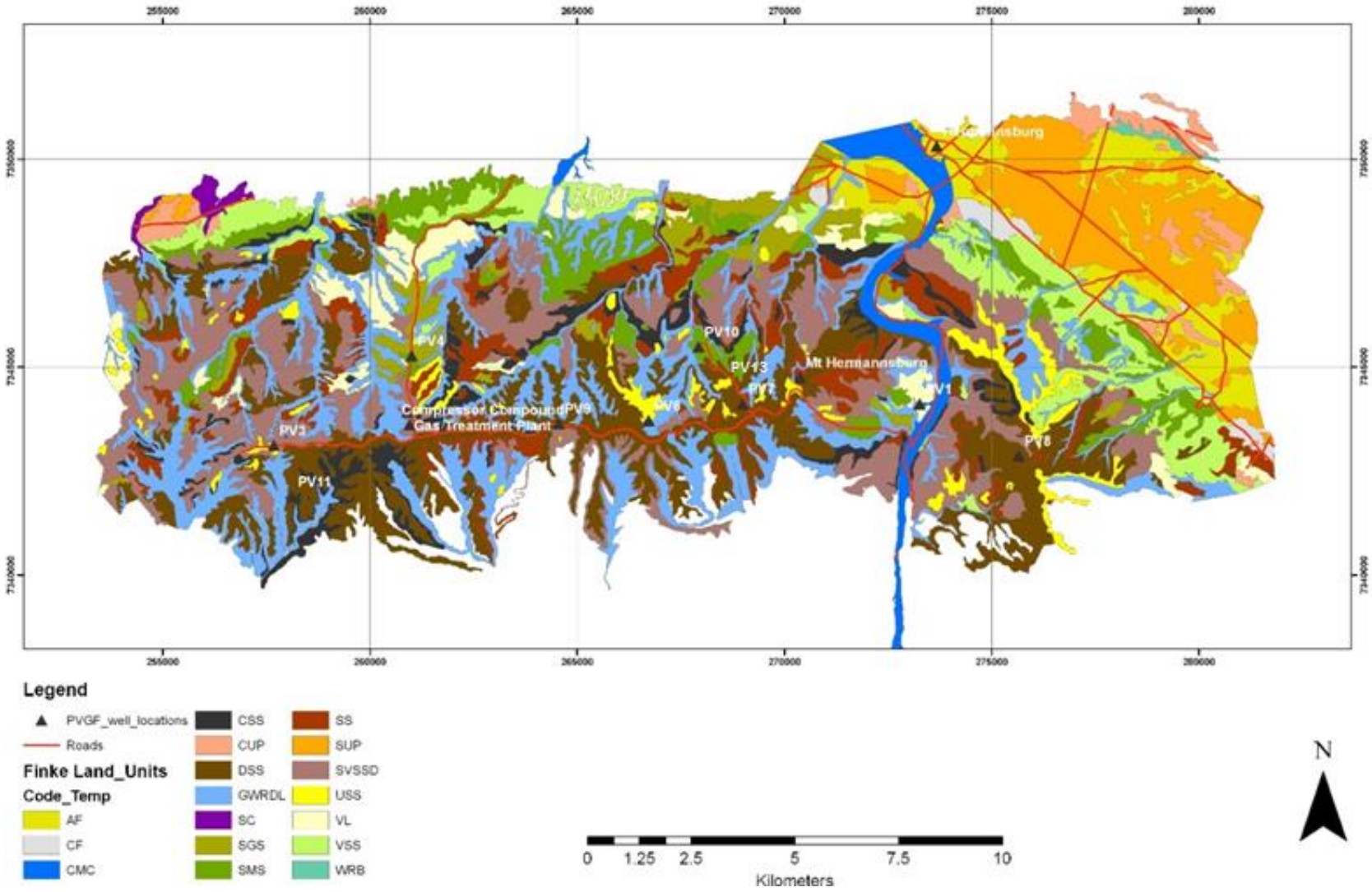


Figure 5-4 Fine scale Land Units as developed by Andrew Schubert in Ghee and Low (2007) from Finke Gorge National Park land unit mapping. Perry's land units equate

5.1.6 Geology

Table 5-5 provides a brief overview of the geology of the OL3 area. The PVGF is in the Amadeus Basin geological region. The outcropping rock in the Krichauff Range is the Hermannsburg Sandstone and Ljiltera Member which is part of the Pertnjara Group of rocks of Devonian to Carboniferous age. Below this Group are the Ordovician Larapinta Group rocks which presently host the PVGF gas producing sources. The layer of interest for PVGF is the Arumbera Sandstone which is part of the Pertaoorrta Group in the Pacoota formation at a depth of around 2 km. This is deeper than the Larapinta Group and is of Cambrian age, as described on the 1: 250,000 geological map sheet for Hermannsburg. A snapshot of the layers is provided below (Ahmad, 2000).

Drill logs from PV-02 indicate that gas is first noticed in the Stairway formation at approximately 1800m but the highest flow is in the Pacoota formation at approximately 2000 m depth. The overlying Stokes siltstone and sandstone provide an impermeable barrier between the fresh water sandstones in Mereenie formation from the Stairway formation.

Table 5-5 Description of surface Geological Units in the OL3 Area (Ahmad, 2000))

Extent in OL3 Area	Map Unit	Rock Group	Age	Description of Lithology
100%	D	Sedimentary	Devonian	Outcropping of Hermannsburg Sandstone

5.1.7 Soils

Three soil types shown in Figure 5-5 occur in the OL3 area as mapped using data from the Digital Atlas of Australian Soils (based on Northcote, et al., 1960-1968). All developments are in the montane area located in soil type BA28 described in Table 5-6. This soil presents a low to moderate erosion risk as they are shallow soils over rocky substrate.

Table 5-6 Description of Soils in the OL3 Area (Northcote, et al., 1960-1968)

Extent in OL3 Developed Area	Soil Type	Landform	Soils
100%	BA28	Bold ranges with broad areas of sandstone plateaux; very extensive areas of bare rock.	Chief soils are shallow stony sands. Small areas of other soils are associated in areas of gentler relief.

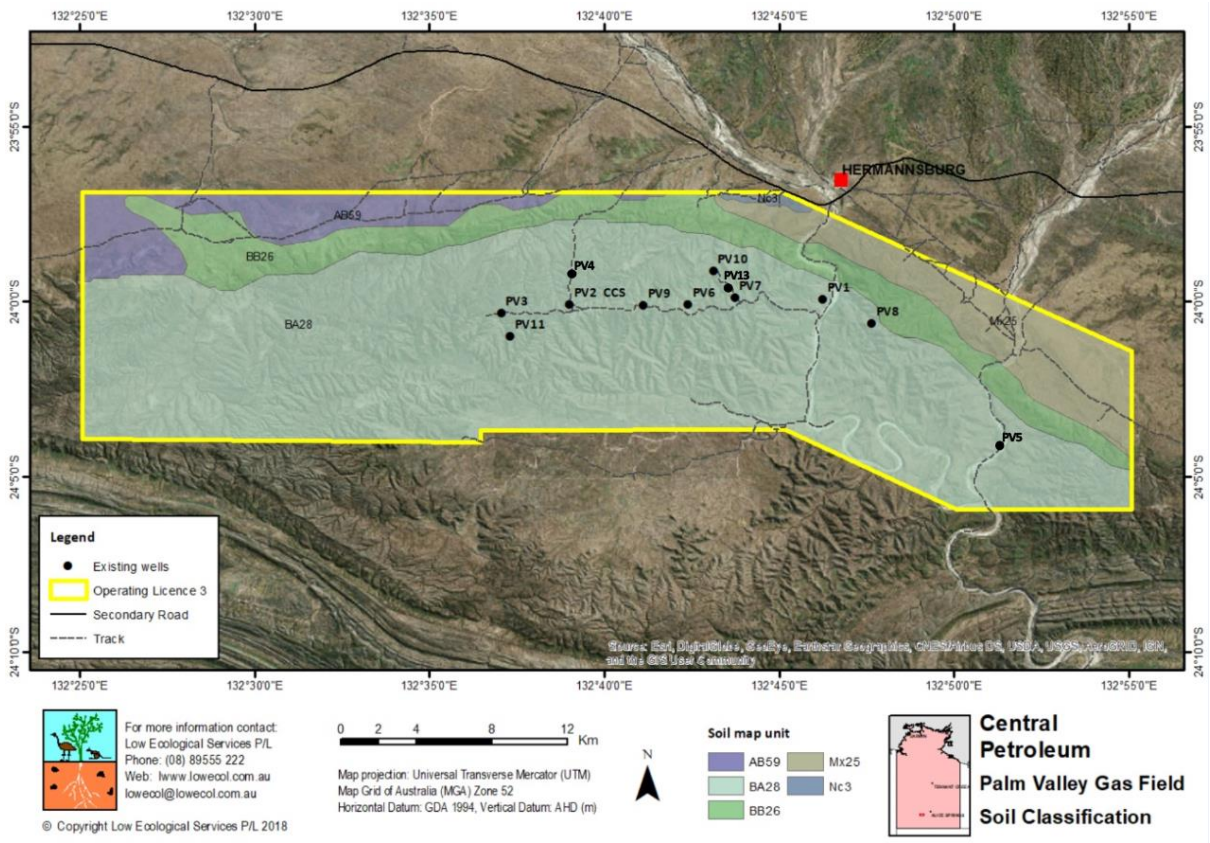


Figure 5-5 Soils of the OL3 area as mapped by Northcote, et al (1960-1968)

5.1.8 Surface Hydrology

The OL3 area is situated within the Finke River Basin which is connected to the Lake Eyre Basin. The Lake Eyre basin is important as it covers almost one-sixth of Australia and is one of the world's largest internally draining river systems. The area supports a range of nationally important natural, social and economic values and about 60,000 people live and work in the Basin. All community sectors across the Lake Eyre Basin, scientists and governments are involved in a collaborative effort principally under the *Lake Eyre Basin Intergovernmental Agreement* to ensure that the health of the unique river systems of the Basin can be maintained (Australian Government, 2011).

There are several major ephemeral streams that join the Finke and Palm Creek from the OL3 area. Ellery Creek and the Finke River, both ephemeral with long lasting water holes,run through the eastern third of OL3; Ellery Creek joins up with the Finke River south of OL3. The Finke River runs out into Lake Eyre during extreme events.

Smaller drainage lines are also present within the OL3 area. The Finke River headwater gorge system is nationally recognised as a significant site, due to the abundance of conservation significant and endemic species. The rock holes and water springs at Palm Valley are within the protection of the Finke Gorge National Park and include the red cabbage palm (*Livistona mariae ssp. mariae*). The surface water in Palm Valley is a combination of rainfall run-off and shallow groundwater recharge as explained in Section 5.1.9.

5.1.9 Hydrogeology

Several water bores have been drilled in the region along the northern flank of the Krichauff Range and Kaporilya Springs was used for Hermansburg water supply in 1935 (Petrick, 2007). DENR on line water bore information shows wells along the north flank of the Krichauff Range are in Hermannsburg Sandstone aquifers where the sandstone is fractured or fissured, extensive and of low to moderate flow rate in wells. Wells assessing regolith ground water in the Missionary Plain north of PVGF shows ground water is highly localised and invariably saline (R. Read, Pers Comm,). A belt of bores running along the James Ranges to the south, is in porous sandstone, extensive and highly productive aquifers.

A detailed description of the hydrogeology of the area is provided by Wischusen et al (2002) in their hydrogeology study; identifying potential sources of water in the Hermannsburg and Palm Valley area including bores and existing dams.

The porous shallow Hermannsburg sandstone, near the surface, may behave as a double porosity aquifer (fracture and matrix permeability), due to the porous sandstone matrix and readily adsorbs flows from percolating seepage, rivers and creeks (Wischusen 2005). In locations where this occurs, the roots of plants have access to a plentiful supply of water. This is the primary reason for the existence of the relict species, red cabbage palm (Livistona mariae ssp. mariae). The red cabbage palm is located in Cycad Gorge on Palm Creek within Finke Gorge National Park and to the south of the park in a small semi-permanent water hole at Running Waters, both of these areas would be classed as Groundwater Dependent Ecosystems (GDE) with water supply draining through the Hermannsburg sandstone from the south flank of the Krichauff Range. Both stands of red cabbage palms are outside the potential impact area in which the Gas Field operational area occurs, even though Cycad Gorge and Palm Creek are within OL3 lease area.

The Stokes siltstone and shale provide an impermeable layer between the fresh water sandstones in the Mereenie formation from the underlying Stairway and Pacoota formations which contain the gas and brackish to saline produced water. The Stairway formation has low permeability of target gas, but the main reservoir is located in the Pacoota formation located approximately 2 km below ground level.

Groundwater dependent ecosystems (GDE) comprise habitats in which plants are dependent on shallow water tables. This environment occurs in the Krichauff Range area where Red Cabbage Palms and River Red Gums occur in Palm Creek and along the Finke River and Ellery Ck. There are no other known locations in the Krichauff Range where this habitat occurs. GDEs in Palm Ck depend on fresh water draining from the adjacent catchment in Hermannsburg Sandstone ranges, including the Krichauff Range. The operational areas of the OL3 gas field occur outside the catchment for Palm Ck, except for PV11 in the NW catchment area for Palm Ck. Since drilling of PV11 was cased and plugged there is no possibility of interchange between the saline Pacoota groundwater at variably about 2000 m below surface level and any surface water draining through the Hermannsburg sandstone. River Red Gum areas in the Finke are likely to be similar to River Red Gums in the Hanson River near TiTree where they can extract water with their roots down to a threshold of about 15m. Other shallow rooted plants in that environment tend to rely on extracting water from shallower silty soils against high pressure gradients (Cook and Eamus, 2017; Richardson, 2011).

5.1.10 Vegetation Communities

The vast majority of the OL3 area falls within vegetation class 92 as described by (Wilson, et al., 1991) in Table 5-7 and shown in Figure 5-6. A small portion of vegetation class 87 is located in the west of the OL3 area.

This vegetation class is well represented in the surrounding area and there is currently no impact on flora communities of conservation significance by the operations in the OL3, nor any expected from activities covered by this FEMP as there will be no change in areas of operation unless a separate EMP is prepared for new operations (such as PV13 which has a separate EMP).

Table 5-7 Description of Vegetation Classes in the OL3 Area (Wilson, et al., 1991)

Broad Vegetation Class	Fine Vegetation Class	Fine Vegetation Class Description	Secondary Community Descriptions	Structural Formation
Low open wood-lands	92	*Triodia brizoides (formerly clelandii)* (Weeping Spinifex) hummock grassland with mixed species low open-woodland over storey.	-	L1H3 Mixed species low open wood lands
Hummock grassland	87	*Triodia brizoides and basedowii* open-hummock grassland with *Acacia aneura* tall sparse-shrubland over storey	–	S1H2 Tall sparse shrubland, Open-hummock grassland

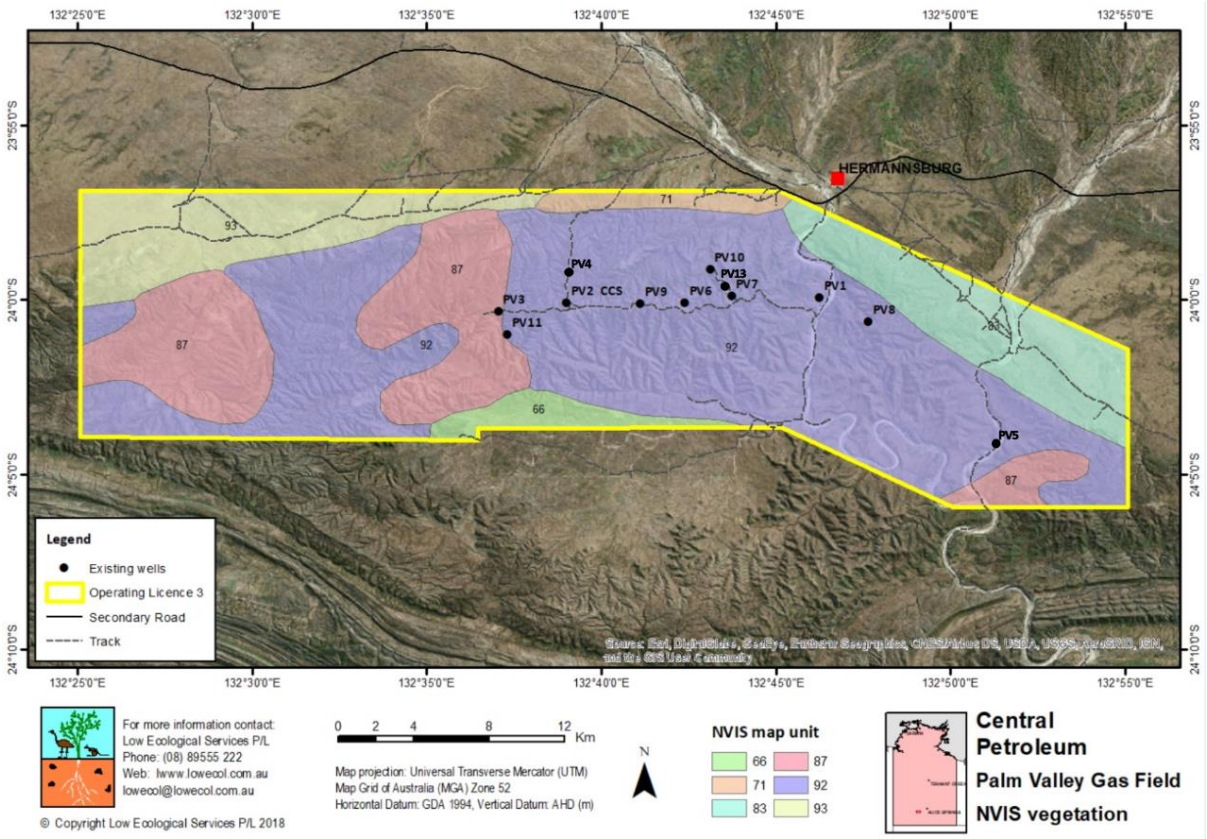


Figure 5-6 Vegetation classes of the OL3 area as mapped by (Wilson, et al., 1991)

5.1.11 Flora of Conservation Significance

A flora species is considered in this report to be of conservation significance if it is:

- Listed as Critically Endangered (Cr), Endangered (En), or Vulnerable (Vu) under the *Territory Parks and Wildlife Conservation Act* (TWPC Act) and has been recorded in the NT Flora Atlas within a 25 km buffer of the OL3 area or has been recorded on field surveys of the area; or
- Listed as Cr, En, Vu or Conservation Dependent under the *EPBC* Act and is identified by a Protected Matters Search Report (PMSR) (Appendix 3) for the area or has been recorded in

the NT Flora Atlas within a 25 km buffer of the OL3 area; or has been recorded on LES field surveys of the area.

There are no flora species of conservation significance matching these criteria within the OL3 area. Table 5-8 provides a list of all Near Threatened (Nt) or Data Deficient (DD) species occurring or potentially occurring within the OL3 area. These species do not require specific management plans; however, their presence will be recorded if identified during the annual environmental survey.

Table 5-8 Flora Species of conservation significance listed under the TPWC or EPBC Act, Identified as occurring or potentially occurring within the OL3 Area.

Scientific Name	Common Name	NT Atlas[1]/TPWC Status[2]	PMSR[3] / EPBC Status[4]	Likelihood of Occurrence
Minuria tridens	Minnie Daisy	Y/VU	Y/VU	Moderate along Finke River but not within current operational areas.
Bolboschoenus caldwellii	Bolboschoenus	Y/En	-	Low, habitat unsuitable in operational areas
Livistona mariae subsp. mariae	Red Cabbage Palm	Y/En	Y/En	Restricted to water course in Palm Valley well removed from current operational areas.
Macrozamia macdonnellii	MacDonnell Ranges Cycad	Y/Nt	Y/En	Restricted to Palm Valley watershed
Thryptomene hexandra	Palm Valley Myrtle	Y/Nt	Y/Vu	Occurs scattered in disturbed areas on sandstone slopes draining to Finke River.

[1] Recorded in the NT Flora Atlas within a 50 km buffer of the OL3 area.
[2] TPWC Status: Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; Nt, Near Threatened; DD, Data Deficient; NE, Not Evaluated; Lc, Least Concern as listed under the *Territory Parks and Wildlife Conservation Act* (TPWC).
[3] Listed on the EPBC PMSR retrieved for the area with a 25 km buffer of the OL3 area (Appendix 3).
[4] EPBC Status: Cr, Critical Endangered; En, Endangered; Vu, Vulnerable as listed under the *Environmental Protection and Biodiversity Act* (EPBC).

Table 5-9 Flora Species of Near Threatened or Data Deficient status Identified as Potentially Occurring within the OL3 Area

Scientific Name	Common Name	NT Atlas[1]/TPWC Status[2]	PMSR[3] / EPBC Status[4]
Acacia sp. Krichauff Range (A.Soos 241)	Whispy Acacia	DD	-
Austrostipa aquarii		Nt	-
Corynotheca licrota	Club-fruit Lily	Nt	-
Eucalyptus lucens	Shiny-leaved Mallee	Nt	-
Hakea grammatophylla	Mountain Hakea	Nt	-

Scientific Name	Common Name	NT Atlas[1]/TPWC Status[2]	PMSR[3] / EPBC Status[4]
Lomandra patens	Iron Grass	Nt	-
Monotaxis luteiflora		Nt	-
Parietaria cardiostegia	Mallee Pellitory	Nt	-
Phyllanthus lacunellus	Sandhill Spurge	DD	-
Pimelea interioris		Nt	-
Swainsona colutoides	Bladder Swainsona	Nt	-
Stenanthemum centrale	Stenanthemum	Nt	-

[1] Recorded in the NT Flora Atlas within a 50 km buffer of the OL3 area.
[2] TPWC Status: Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; Nt, Near Threatened; DD, Data Deficient; NE, Not Evaluated; Lc, Least Concern as listed under the *Territory Parks and Wildlife Conservation Act* (TPWC).
[3] Listed on the EPBC PMSR retrieved for the area with a 25 km buffer of the OL3 area (Appendix 3).
[4] EPBC Status: Cr, Critical Endangered; En, Endangered; Vu, Vulnerable as listed under the *Environmental Protection and Biodiversity Act* (EPBC).

The most recent comprehensive whole field flora and fauna assessment for PVGF was undertaken in 2007 by Low Ecological Services (Ghee & Low, 2007). There were only two *TPWC* Act near threatened flora species identified during this survey, *Eucalyptus lucens* and *Stenanthemum centrale.*

5.1.12 Introduced Flora and Weed Species

An introduced flora species is considered in this FEMP to be of management concern if it is:

- Listed as Declared Weed under the NT *Weeds Management Act* and has been recorded in the NT Flora Atlas within a 25 km buffer of the OL3 area or has been recorded on field surveys of the area; or
- Listed as a Weed of National Significance (WoNS) and is identified by a Protected Matters Search Tool report (Appendix 3); for the area or has been recorded in the NT Flora Atlas within a 25 km buffer of the OL3 area; or has been recorded on field surveys of the area.
- An invasive introduced species known to dominate areas resulting in exclusion of native species and potentially causing environmental harm such as Buffel Grass (Cenchrus ciliaris).

Table 5-10 provides a summary of introduced flora and weeds species identified as potentially occurring for the OL3 area. Only one declared weed, Mexican Poppy, has been identified on site and weed mitigation measures will be focused on this species. Buffel Grass is an introduced pastoral plant which is highly invasive in disturbed areas and flourish during long periods of wet conditions. It is dominant around the base of the Krichauff Range.

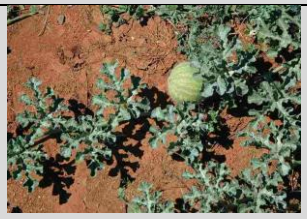
No WoNS identified as potentially occurring in the OL3 area has been recorded on site to date.

There are three classes of Declared Weeds in the NT:

- Class A – To be eradicated
- Class B – Growth and spread to be controlled
- Class C – Not to be introduced to the Territory

All Class A and Class B weeds are also considered to be Class C weeds.

Table 5-10 Introduced Flora and Weed Species of Management Concern Identified as Potentially Occurring within the OL3 Area

Scientific Name	Common Name	Status [1]	Previously recorded in gas field	Visual identification reference
Argemone ochroleuca	Mexican Poppy	B and C	Yes – PV-07 well from imported sand for bedding of tank	
Prosopis spp.	Mesquite	A and C, WoNS	No	
Tamarix aphylla[1]	Athel Pine	A and C, WoNS	No	
Cenchrus cilliaris	Buffel Grass	Invasive introduced grass	Common at lower elevations, invades disturbed area around operational areas.	
Citrullus colocynthis	Paddy Melon	Wide spread introduced melon	Uncommon scattered plants around disturbed site around several operational areas.	
Opuntia Stricta	Prickly Pear	A	No – has occurred in missionary plain around the historic precinct outside of the operations area	

[1] Declared Weed Class as identified under the *Territory Parks and Wildlife Conservation Act* (TPWC Act); Or WoNS

5.1.13 Native Fauna

A fauna species is considered in this FEMP to be of conservation significance if it is:

- Listed as Cr, En, or Vu under the TWPC Act and has been recorded in the NT Fauna Atlas within a 25 km buffer of the OL3 area or has been recorded on field surveys of the area; or
- Listed as Cr, En, Vu, Conservation Dependent, Listed Migratory Species or Listed Marine Species under the EPBC Act and is identified by a PMSR (Appendix 3) for the area or has been recorded in the NT Fauna Atlas within a 25 km buffer of the OL3 area; or has been recorded on LES field surveys of the area.

Table 5-11 provides a summary of fauna species of conservation significance identified as potentially occurring within the OL3 area. Table 5-12 provides a summary of fauna species listed as near threatened and data deficient under the TPWC Act or under an International Agreement in the EPBC Act, identified as potentially occurring within the lease area. As PVGF has been in operation in its current state for a long period of time and there have been no incidents or impacts on the threatened species identified as potentially occurring within OL3, continuation of operations under the current intent of resuming operation of the long established PVGF operational areas does not require conservation species specific management plans or mitigation measures. However the presence of the isolated slater skink individuals immediately north of PV2 operational lay down area has resulted in site specific mitigation measures including sediment control banks and flagging of the site to be avoided to minimise risk to slater skinks within the lease area. The risk assessment in Section 7 and mitigation measures in Section 8 adequately account for the protection of fauna in the OL3 area, including the potential for conservation significant fauna and the presence of slater skinks, from activities at the PVGF.

Table 5-11 Fauna Species of Conservation Significance listed under the TPWC or EPBC Act and identified as occurring or potentially occurring within the OL3 Area.

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
Bird	*Calidris acuminate*	Sharp-tailed sandpiper		Mi, Ma	J, C, R	X		Low	No suitable habitat in operational area
Bird	*Calidris ferruginea*	Curlew sandpiper	VU	CR, Mi, Ma	J,C,R,B	X		Low	No suitable habitat in project area
Bird	*Erythrotriorchis radiatus*	Red Goshawk	Vu	Vu		X	X	low	No suitable habitat in operational area
Bird	*Falco hypoleucos*	Grey Falcon	VU	VU		X	X	Low	No suitable habitat in operational area
Bird	*Leipoa ocellata*	Malleefowl	Cr	VU			X	Low	No suitable habitat in operational area
Bird	*Pezoporus occidentalis*	night parrot	CR	EN		X		Low	No suitable habitat in operational area
Bird	*Polytelis alexandrae*	princess parrot	VU	VU		X	X	Low	No suitable habitat
Bird	*Rostratula australia - check record*	Australian painted snipe		EN		X	X	Low	No suitable habitat
Fish	*Chlamydogobius japalpa*	Finke desert goby	VU				X	Nil	Restricted to Finke River system and no suitable habitat in operational area. Will not be considered further.
Invertebrate	*Basedowena squamulosa*	Land snail	VU				X	Low-Moderate	Very small range and no suitable habitat
Invertebrate	*Bothriembryon spenceri*	Snail	VU				X	Low-Moderate	Very small range and no suitable habitat

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
Invertebrate	*Divellomelon hillieri*	Snail	VU				X	Low-Moderate	Very small range and no suitable habitat
Invertebrate	*Granulomelon arcigerens*	Snail	VU				X	Low	Very small range and no suitable habitat
Invertebrate	*Semotrachia elleryi*	Snail	VU				X	Low	Very small range and no suitable habitat
Invertebrate	*Semotrachia esau*	Snail	VU				X	Low-Moderate	Very small range and no suitable habitat
Invertebrate	*Semotrachia euzyga*	Snail	EN				X	Low	Very small range and no suitable habitat
Mammal	*Dasycercys blythi*	Brush-tailed mulgara	Vu	Vu			X	low	No suitable habitat in operational area
Mammal	*Dasyurus geoffroii*	Western Quoll	Er	Vu			X	Regionally extinct	
Mammal	*Macroderma gigas*	Ghost Bat	NT	VU			X	Nil	Records from pre-1970. Current range restricted to Northern Australia. Will not be considered further.
Mammal	*Macrotis lagotis*	greater bilby	VU	VU		X	X	Low	No suitable habitat within operational area.
Mammal	*Notoryctes typhlops*	Southern Marsupial Mole	Vu	En			X	low	No suitable habitat in operational area
Mammal	*Petrogale lateralis*	Black-footed rock wallaby	Vu	Vu		X	X	Moderate	No sign present in isolated marginal habitat and project areas are not suitable habitat.
Mammal	*Trichosurus vulpecula*	common brushtail possum	EN	-			X	Low	No suitable habitat in project areas but recent discovery west of gas

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
									field indicates remote possibility on lease.
Mammal	*Zyzomys pedunculatus*^	central rock-rat	EN	EN		X		Low	All recent records within West MacDonnell National Park
Reptile	*Liopholis kintorei*	Great Desert Skink		Vu			X	Low	No suitable habitat in operational area
Reptile	*Liopholis slateri slater*	slater's skink	Vu	EN		X	X	High	No suitable habitat but known individual in unlikely mountain habitat downslope from PVGF compressor site 13km south of known population on Finke River flood plain

[1] TPWC Status: Er, Regionally Extinct, Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; Nt, Near Threatened; DD, Data Deficient; Ne, Not Evaluated; Lc, Least Concern as listed under the *Territory Parks and Wildlife Conservation Act* (TPWC).

[2] EPBC Status: Ex, Extinct, Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; MIG, Migratory; MAR, Marine; WET, Wetland; TER, Terrestrial; (L) MAR, Listed Marine Species as listed under the *Environmental Protection and Biodiversity Act* (EPBC).

[3] Listed on the EPBC PMSR retrieved for the area with a 25 km buffer of the OL3 area (Appendix 3).
[4] Recorded in the NT Fauna Atlas within a 25 km buffer of the OL3 area.

[5] Likelihood of occurrence within OL3 determined through consideration of available habitat and existing records within 25km of lease area.

Table 5-12. Fauna species listed as Near Threatened or Data Deficient under the TPWC or under an International Agreement in the EPBC Act identified as occurring or potentially occurring within the OL3 area.

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
Bird	*Acrocephalus australis*	Australian Reed Warbler	NT				X	Low	No suitable habitat in operational areas
Bird	*Actitis hypoleucos*	Common sandpiper		Mi, Ma	J, C, R	X		Low	No suitable habitat in operational areas
Bird	*Amytornis striatus*	Striated Grasswren	NT				X	Low	No suitable habitat in operational area
Bird	*Apus pacificus*	Fork-tailed swift		Mi, Ma	J, C, R	X		Moderate	Aerial migrant
Bird	*Ardea alba*	Great egret		Ma	-	X		Low	No suitable habitat in operational areas
Bird	*Ardea ibis*	Cattle egret		Ma	-	X		Low	No suitable habitat in operational areas
Bird	*Ardeotis australis*	Australian bustard	NT				X	Low	No suitable habitat in operational area
Bird	*Burhinus grallarius*	Bush-stone curlew	NT				X	Low`	Unsuitable habitat in operational areas
Bird	*Calidris acuminate*	Sharp-tailed sandpiper		Mi, Ma	J, C, R	X		Low	No suitable habitat in operational areas
Bird	*Calidris melanotos*	Pectoral Sandpiper		Mi, Ma	J,C,R,B	X		Low	No suitable habitat in operational areas
Bird	*Calidris veredus*	Oriental Plover		Mi		X		Low	No suitable habitat in operational areas
Bird	*Calyptorynchus banksia samueli*	Red-tailed Black-cockatoo	NT				X	Moderate	No suitable habitat in project areas
Bird	*Charadrius veredus*	Oriental plover		Mi, Ma	C, J, R, B	X		Low	No suitable habitat in operational areas
Bird	*Chrysococcyx osculans*	Black-eared Cuckoo		Ma					Wide ranging vagrant and No suitable habitat in operational areas
Bird	*Conopophila whitei*	grey honeyeater	DD				X	Moderate	Irregular vagrant

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
Bird	*Dromaius novaehollandiae*	emu	NT				X	Low	No suitable habitat
Bird	*Glareola maldivarum*	Oriental pratincole		Mi, Ma	C, J, R	X		Low	Possible vagrant on cleared areas
Bird	*Lophoictinia isura*	Square-tailed kite	NT				X	Low	May pass overhead but no suitable habitat in operational areas
Bird	*Merops ornatus*	Rainbow bee-eater		Ma	-	X		High	Wide ranging summer migrant
Bird	*Motacilla cinerea*	Grey wagtail		Mi, Ma	C, J, R	X		Low	Rare migrant, habitat unsuitable in project areas
Bird	*Motacilla flava*	Yellow wagtail		Mi, Ma	C, J, R	X		Low	Rare migrant, habitat unsuitable in operational areas
Bird	*Neophema splendida*	Scarlet-chested parrot	NT				X	Moderate	No suitable habitat in operational areas
Bird	*Pandion haliaetus*	Osprey		Mi		X		Low	No suitable habitat in operational areas
Bird	*Porzana flumina*	Australian Spotted Crake	DD				X	Low	No suitable habitat
Bird	*Porzana pusilla*	Baillon's Crake	DD				X	Low	No suitable habitat
Bird	*Pyrrholaemus brunneus*	redthroat	NT				X	Moderate	No suitable habitat in operational areas
Bird	*Rostratula benghalensis*	Painted Snipe		Ma	C, J, R	X		Low	No suitable habitat in operational areas
Bird	*Stictonetta naevosa*	Freckled Duck	NT				X	Low	No suitable habitat

Type	Scientific Name	Common Name	Status			Recorded		Likelihood of Occurrence	Notes
			TPWC	EPBC	International Agreement	PMST	NT Fauna Atlas		
Fish	*Craterocephalis centralis*	Finke Hardyhead	NT				X	nil	No suitable habitat in operational areas
Fish	*Mogurnda larapintae*	Desert Mogurnda	NT				X	nil	No suitable habitat in operational areas
Invertebrate	*Sinumelon bednalli*	Bednall's Land Snail	NT				X	Low	Very small range and no suitable habitat
Mammal	*Antechinomys laniger*	Kultarr	NT				X	Nil	Habitat unsuitable
Reptile	*Anilios centralis*	Centralian blind snake	DD	-			X	low	Habitat unsuitable
Reptile	*Pseudechis australis*	king brown snake	NT				X	Moderate	Wide ranging

[1] TPWC Status: Er, Regionally Extinct, Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; Nt, Near Threatened; DD, Data Deficient; Ne, Not Evaluated; Lc, Least Concern as listed under the *Territory Parks and Wildlife Conservation Act* (TPWC).

[2] EPBC Status: Ex, Extinct, Cr, Critical Endangered; En, Endangered; Vu, Vulnerable; MIG, Migratory; MAR, Marine; WET, Wetland; TER, Terrestrial; (L) MAR, Listed Marine Species as listed under the *Environmental Protection and Biodiversity Act* (EPBC).

[3] Listed on the EPBC PMSR retrieved for the area with a 25 km buffer of the OL3 area (Appendix 3).
[4] Recorded in the NT Fauna Atlas within a 25 km buffer of the OL3 area.

[5] Likelihood of occurrence within OL3 determined through consideration of available habitat and existing records within 25km of lease area

The most recent comprehensive whole-field flora and fauna assessment for PVGF was undertaken in 2007 by Low Ecological Services (Ghee & Low, 2007). Intensive fauna surveys were conducted prior to specific well site planning and development for PV11 (2003/04) and PV12 (2015) by Low Ecological Services and did not find threatened species in the vicinity of the particular sites. The only current EPBC listed threatened fauna species recorded at the PVGF in 2007 was the black-footed rock wallaby, *Petogale lateralis* (status vulnerable) and there was no evidence of the species around any of the project or operational areas.

5.1.14 Introduced Fauna and Pest Species

An introduced fauna species is considered in this FEMP to be of management concern if it is:

- Listed in the NT Fauna Atlas as "Introduced" and has been recorded within a 25 km buffer of the OL3 area; or
- Identified as an invasive species by a PMSR for the area within a 25 km buffer of the OL3 area (Appendix 3); or
- Has been recorded on LES field surveys of the area.

Table 5-13 provides a summary of introduced fauna and pest species identified as potentially occurring for the OL3 area.

Table 5-13 Introduced Fauna and Pest Species of Management Concern Identified as Potentially Occurring within the OL3 Area

Type	Scientific Name	Common Name	NT Atlas[1]	PMSR[2]	Likelihood in operational area
Bird	*Columbia livia*	Domestic Pigeon	No	Yes	no
Bird	*Passer domesticus*	House Sparrow	No	Yes	no
Mammal	*Bos Taurus*	Domestic Cattle	Yes	Yes	Low
Mammal	*Camelus dromedarius*	Camel	No	Yes	Low
Mammal	*Canis lupus familiaris*	Domestic Dog	No	Yes	Low
Mammal	*Equus caballus*	Horse	Yes	Yes	Moderate
Mammal	*Felis catus*	Domestic Cat	Yes	Yes	High
Mammal	*Mus musculus*	House Mouse	Yes	Yes	High
Mammal	*Oryctolagus cuniculus*	European Rabbit	Yes	Yes	High
Mammal	*Vulpes*	European Fox	Yes	Yes	Moderate
Mammal	*Sus scrofa*	Pig	Yes	Yes	No
Mammal	*Equus asinus*	Donkey	Yes	Yes	low

[1] Recorded in the NT Fauna Atlas within a 25 km buffer of the OL3 area.
[2] Listed on the EPBC PMSR retrieved for the area with a 25 km buffer of the OL3 area (Appendix 3).

5.1.15 Fire History

Northern Australian Fire Information (NAFI) records show one large bushfire in the OL3 area between 2000 and 2016. This fire began in the Finke River and burnt a large area in the Krichauff Range on the north-eastern side of the PV-04 to PV-06 and PV-07 wells access roads in Oct/Nov 2002. The 2002 bushfire season followed several years of above average rainfall in Central Australia. The most recent bushfire came in close to PV-04 well in 2011 (NAFI, 2016) and a small area southwest of PV-07 in 2018. Fire breaks were established by Tjuwampa Rangers under training by BFC south of the main

east west access road southwest of the Gas Plant to Palm Paddock in Finke Gorge National Park in 2007/08 and by NT Parks and Wildlife Rangers in 2018.

The majority of the OL3 area has a low bushfire risk due to scattered shrub vegetation, rocky surface and low ground cover. Both bushfires in the area were following years of above average rainfall, which resulted in high vegetation growth. Bushfire potential is higher following favourable vegetation growing conditions.

5.2 Socio-economic Environment

5.2.1 Surrounding Land Tenure

The Palm Valley and the Finke River areas south east of PVGF are part of the Finke Gorge National Park and have a rich cultural history. PVGF lies on Aboriginal land of the Western Arrernte People.

5.2.2 Surrounding Populated Places

Populated places close to the PVGF area are:

- Hermannsburg approximately 14 km to the north east,
- Glen Helen Resort, approximately 35 km to the north,
- Aeryonga community 40 km west of the gas plant, and
- Alice Springs approximately 130 km to the east.

Operations at the PVGF are not likely to affect the Alice Springs community due to distance. Glen Helen and Hermannsburg may be impacted by the activities due to extra traffic along the main public access road connecting these two places and PVGF. However, this is very unlikely to happen.

5.2.3 Cultural Heritage

An online search of the NT heritage register showed 19 publicly listed heritage sites in the MacDonnell Shire locality, none of which are located in the OL3 area. No non-public sites were found by the online search. (NT Government, 2018). CLC has worked with the TOs in the area for many years and has provided clearances for the project area.

5.2.4 Heritage Areas identified EPBC Protected Matters Search Report

An EPBC PMSR retrieved for the OL3 area identifies one National Heritage Places, The Hermannsburg Historic Precinct (Appendix 3), which is located within 25 km of OL3. No operations at the PVGF will impact on this place as it is outside of all operational areas and not located on any access track or road associated with PVGF operations.

5.2.5 Archaeological Surveys

The OL3 area is on Aboriginal Land Trust, and as such a CLC clearance is required before any new works are commenced. In the event of new construction works a qualified archaeologist will examine all be on-site before clearing and construction. Since the PVGF quarterly surveys have been conducted by LES, traditional owners have accompanied LES staff to conduct walk over surveys including examination of sites for artefacts and generally found a sparse scatter of artefacts. A heritage and archaeological survey at PV12 in 2014 (Everick Heritage Consultants Pty Ltd) carried out an assessment of archaeological sites and heritage sites as per the *NT Heritage Act* and found a low scatter of stone chippings deemed to be not significant.

5.2.6 CLC Sacred Sites Clearance Certificate

CP has a current CLC Sacred Site Clearance Certificate for the PVGF existing operations on OL3 (C2015-035). CP will seek the necessary approvals and CLC Sacred Site Clearance for any new proposed operations within the OL3 area.

6 DESCRIPTION OF ACTIVITY

6.1 Site Access

Access to the PVGF from Alice Springs is via a network of sealed and unsealed public and private roads, heading west from Alice Springs along Larapinta Drive/Red Centre Way to Hermannsburg. The main turn off to the PVGF is on the left, 6.5 km past Finke River crossing near Hermannsburg.

CP maintains roadways within the PVGF extending from the main road turnoff through the CTP, along the PV-06, PV-03 and PV-01 wells flow lines to the Palm Valley National Park Road (Finke River).

The roads are generally unsealed gravel and maintained to be suitable for four-wheel drive and truck access only.

An airstrip suitable for use by small aircraft is available at Hermannsburg in case of emergency.

6.2 Existing Infrastructure

Existing site infrastructure relevant to PVGF includes:

- Existing private access roads constructed and maintained by CP.
- Wells and gathering network. Figure 6-1 shows the general layout of wells.
    - Eleven wells have been drilled on the field, six of which have produced gas for sale. An additional well PV13 is currently under development and is expected to commence production in 2019 (note: The well construction and connection are managed under a separate EMP and once complete the well will operate under this FEMP).
    - In-field gathering system (approx. 22.5 km) generally adjacent to road network. Figure 6-1 shows a map of the location of the in-field gathering system.
    - Produced water storage facilities.
    - Evaporation pond located adjacent to PV-09.
- Central Compression Station (CCS). Figure 6-2 shows an annotated aerial photograph of the CCS.
    - Consists of slug catcher, five reciprocating engine driven gas compressors totalling 3600 HP, parts shed, water reinjection skid and inlet and outlet separators. Compressors 2, 3, 4 and 5 (totalling 3200 HP) are currently on line to meet pressure and deliverability requirements of the current gas sales agreement.
- Central Treatment Plant (CTP). Figure 6-3 shows an annotated aerial photograph of the CTP.
    - Consists of glycol dehydration plant equipment, separation, heating and cooling, reticulated pipe-work, controls, cold vent, utilities systems and support infrastructure, including office, control room, maintenance workshop and accommodation-messing.

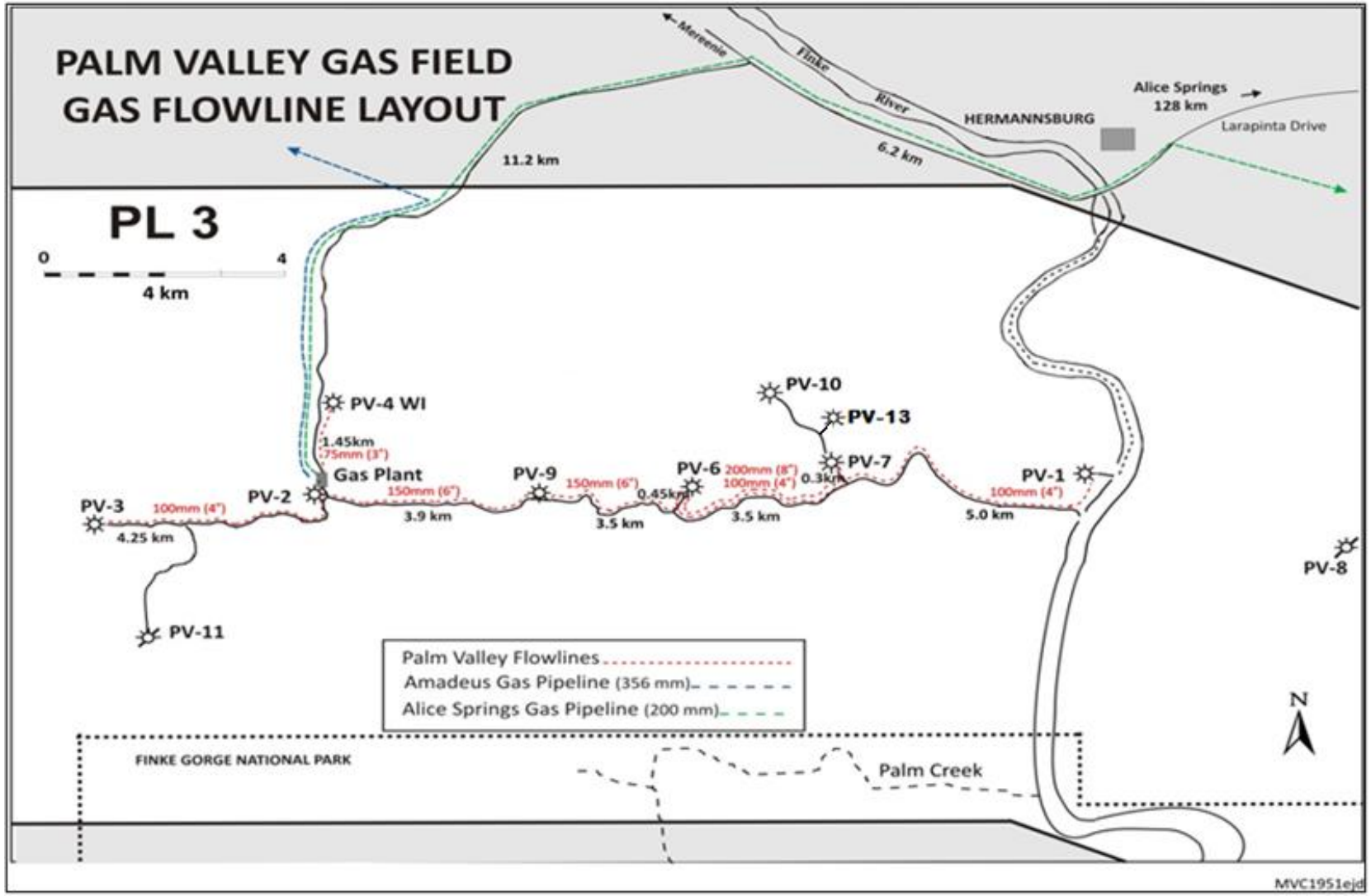


Figure 6-1 Map showing location of the PVGF infrastructure layout

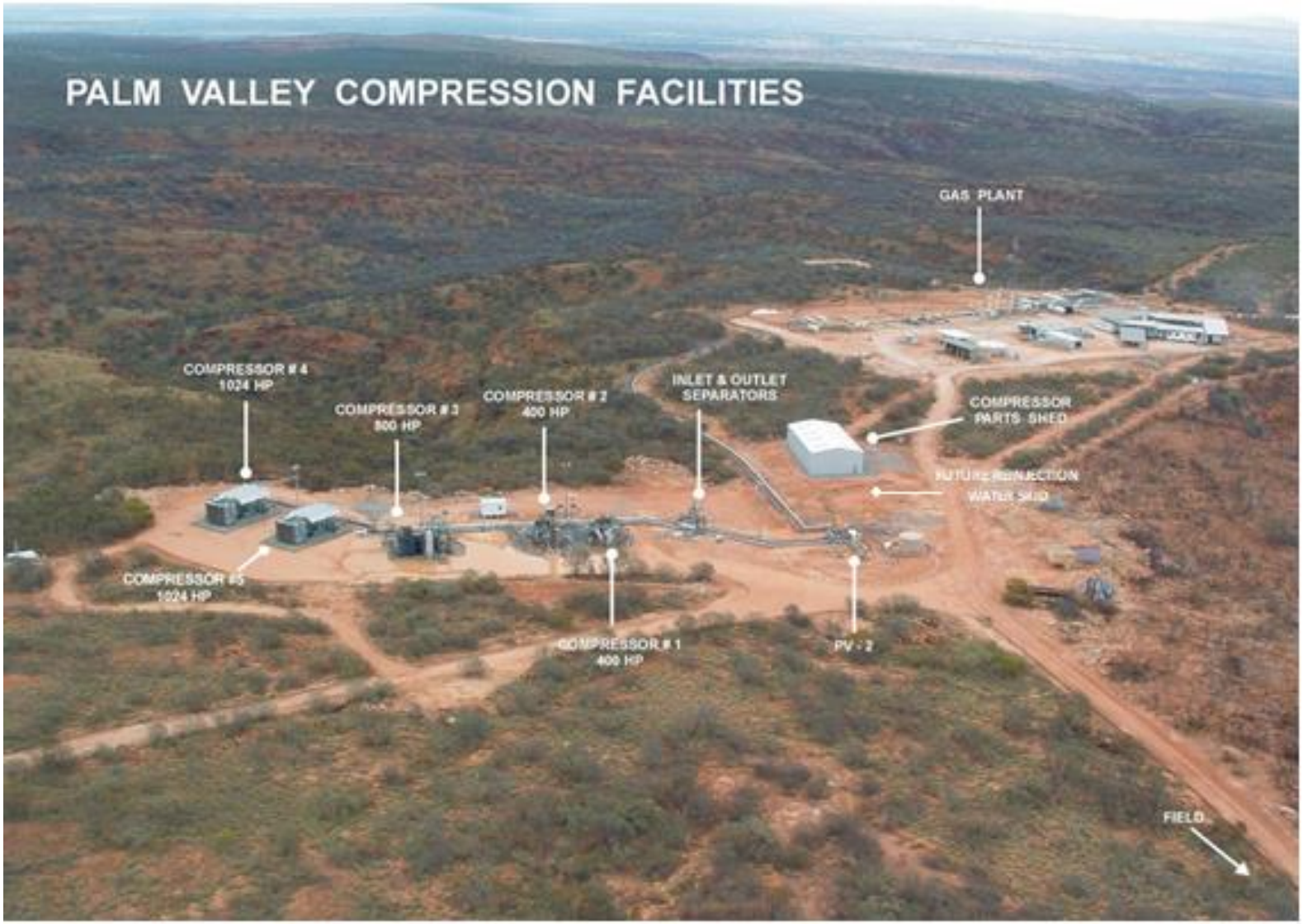


Figure 6-2 Annotated aerial image of the PVGF Central Compression Station

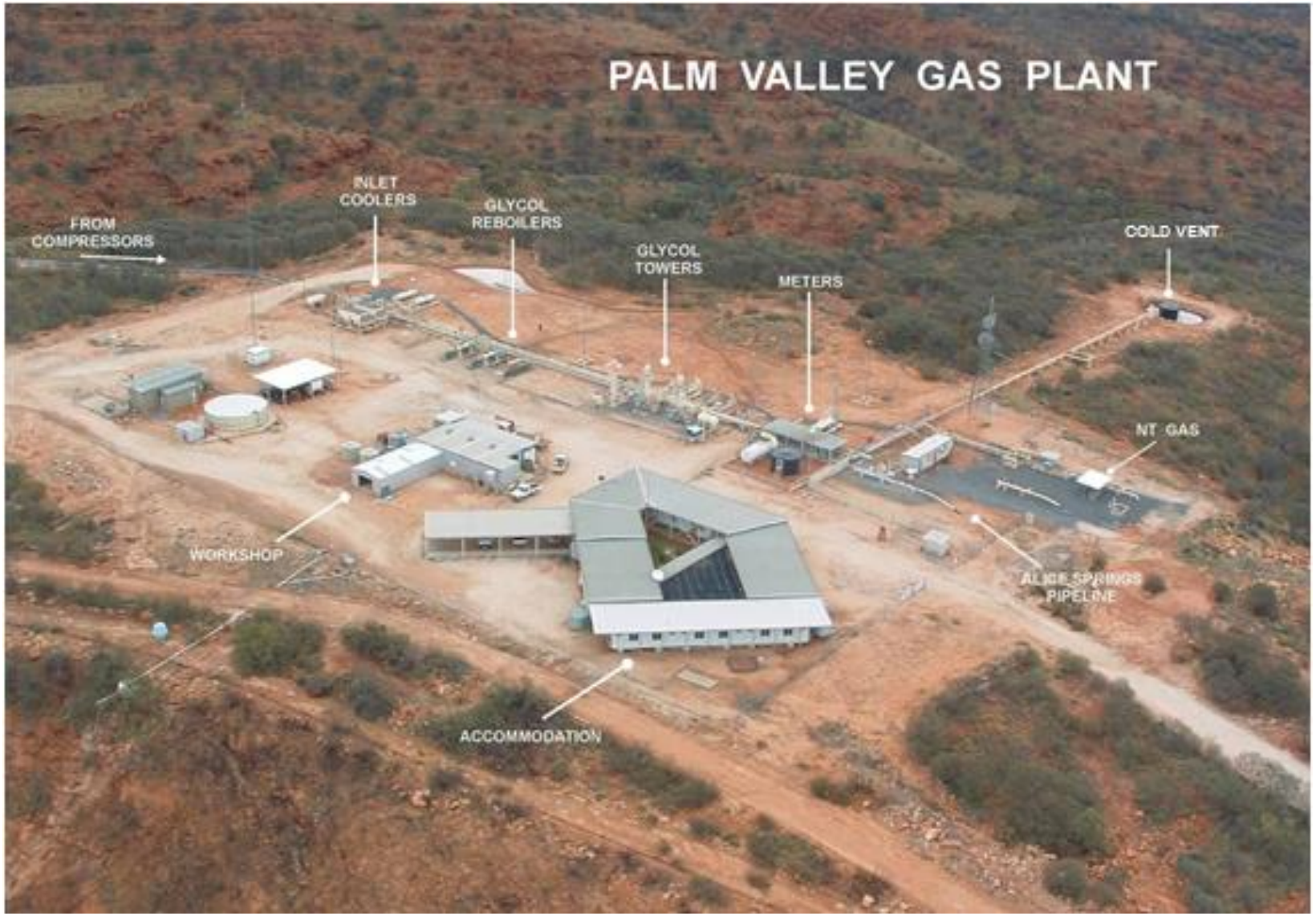


Figure 6-3 Annotated aerial image of the PVGF Central Treatment Plant

6.3 Field History and Overview

6.3.1 History

The PVGF is situated on the Palm Valley anticline in the central northern Amadeus Basin of the Northern Territory, Australia. The field supplies natural gas to the Northern Territory market. Production and gas sales to Alice Springs commenced in August 1983 and gas sales to Darwin commenced in October 1986 under 25-year term contracts. The sales agreement was renewed on the 16th January 2012 under a 17-year term contract.

PVGF is normally operated on a 24/7 basis by on site CP personnel. The PVGF can also be operated, monitored and controlled remotely from the Dingo Gas Field (Dingo) control room located at Brewer Estate south of Alice Springs. The key production management decisions are provided by senior CP personnel located in Brisbane.

The production facilities, as shown in Figure 6-1, consist of:

- Wellheads;
- Gathering System;
- Central Compression Station (CCS); and
- Central Treatment Plant (CTP).

6.4 Operations

6.4.1 Plan

The completion of the Northern Gas Pipeline (NGP) allows CP to enter the east coast gas market and consequently CP commenced production from PVGF from October 2018 onwards. The facility will be controlled locally from the PVGF control room situated near the Central Treatment Plant. The facility will be permanently manned by an operations team located at the PVGF facility.

6.4.2 Production Agreements

Central has a portfolio of Gas Supply and Purchase Agreements which can be delivered from the Palm Valley or Mereenie fields. The field production policy is to produce gas in accordance with the directions and guidelines set by the NT DPIR. Central Petroleum will use reasonable endeavours to produce gas from the field using the gas delivery system in a cost-effective manner in accordance with good oil field practice to meet gas demand under any gas sales agreement.

6.4.3 Conceptual Site Model (CSM)

Figure 6-4 is a conceptual site model for the PVGF operations, outlining all inputs and outputs from the system. Each area (A1, A2, A3, A4 and A5) and the associated infrastructure is described in detail from Section 6.4.5 to Section 6.4.10. Table 6-1 summarises the main purpose of each section with an overview of environmental impact. Table 7-3 and Table 7-4 cross-reference the relevant risk assessment and activities associated with each area in the CSM.

The production facilities from wellhead through to the head of the Alice Springs and Darwin pipelines (export facilities) are operated and maintained by CP.

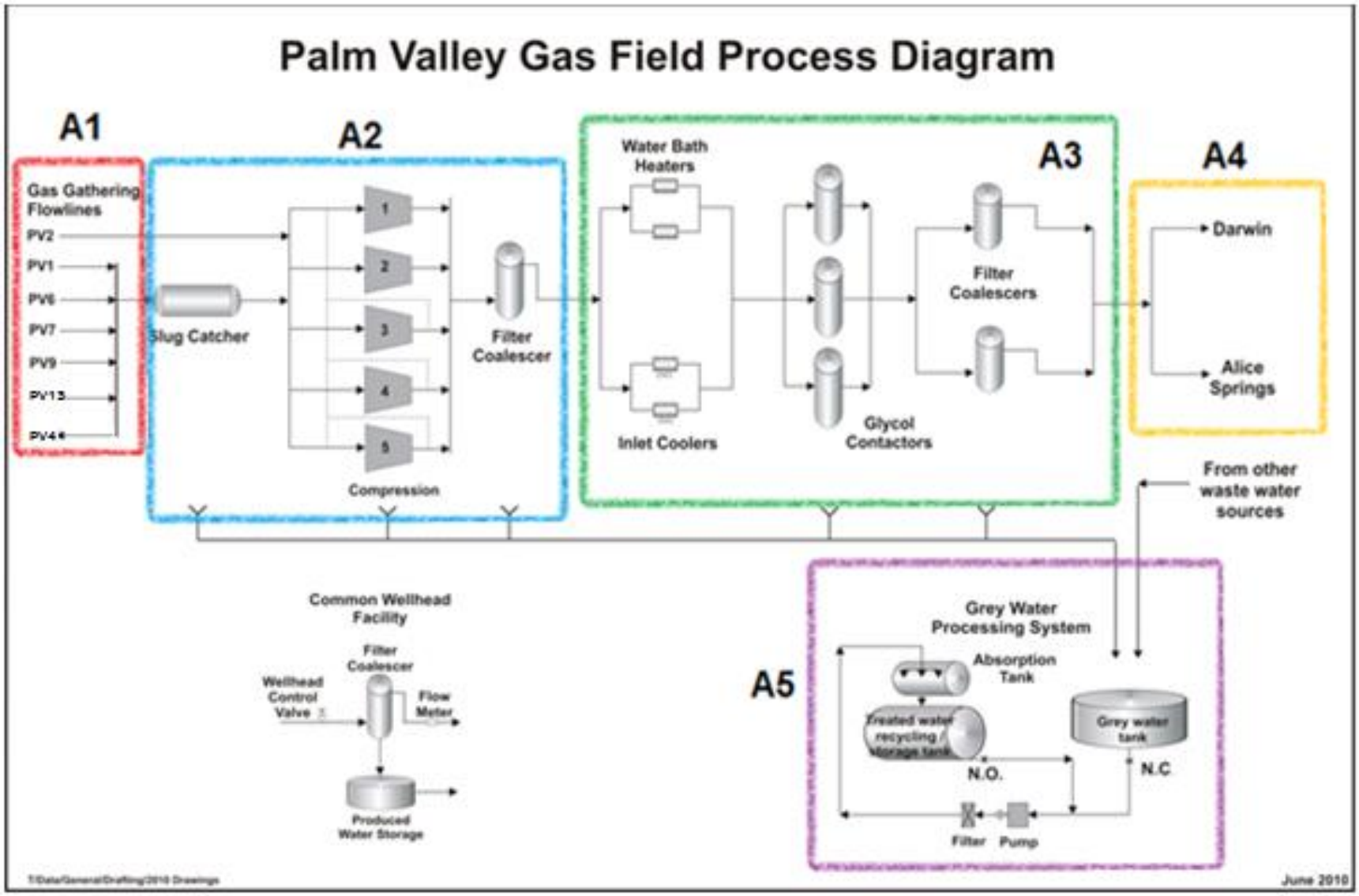


Figure 6-4 Palm valley gas field process diagram conceptual site model

Table 6-1 Summarised Purpose of each Operation Section

Area	Facility	Purpose	Footprint Impact
1. A1 Input	Wells, Gathering system	Collection of gas from operating gas wells with produced water stored at well, transported to a central location at PV2 for treatment and reinjection to PV4.	Small environmental footprint as small area required to be kept clear for maintenance and operation of well heads. Any areas previously cleared for drilling have been sufficiently rehabilitated. Gathering lines are above ground on pipe supports, with exception of road crossing.
2. A2 Process	CCS – Slug catcher – Compressors – Filter Coalescer	Further free liquids are removed in the slug catcher before entering the CCS and taken to the grey water system for processing. In the CCS the water saturated gas is compressed to required pipeline pressure to feed into the CTP.	Spatially contained to immediate vicinity.
3. A3 Process	CTP – Gas treatment: – Heaters and Coolers – Glycol contactor	Processing of gas to reach sales export quality via dehydration processes.	Spatially contained to immediate vicinity.
4. A4 Output	Gas Sales – Pipeline transfer	The PVGF is capable of providing natural gas directly into both pipelines: the Amadeus Gas Pipeline (owned and operated by APA) and the Alice Springs Pipeline.	Sales gas leaves the PVGF at this point; environmental impacts associated with transport of sales gas past this point is not covered by this FEMP.
5. A5 Output	Waste water processing facility	Waste water (from wash down or run-off water) treated to reduce hydrocarbons and salt concentrations and disposed of through a licensed company	Low impact

6.4.4 Operations Covered by this FEMP

According to the *Petroleum (Environment) Regulations*, all 'regulated activities' must be covered by an approved EMP. Regulated activities are defined in Section 5 of the *Petroleum (Environment) Regulations* as "an activity or a stage of an activity:

(a) carried out, or proposed to be carried out, in connection with a technical works programme for a petroleum interest; and

(b) that has, or will have, an environmental impact or environmental risk."

Table 6-2 lists the operations covered by this FEMP.

Table 6-2 PVGF Activities Covered by this FEMP

Palm Valley Gas Field Operations	
Covered by FEMP	**Section**
Road and access track maintenance/Civil maintenance	6.1, 6.2, 6.4.18, 8.2.5, 8.2.8, 8.2.10
Weed management and control	8.2.7
Well operations, maintenance and monitoring	6.4.5, 6.4.5.1,6.4.6.1, 8.2.1, 8.2.2
Reinjection	6.4.11, 6.4.11.1, 8.2.1, 8.2.2
Pipeline and flow-lines	6.4.6.2, 6.4.9, 8.2.1
Production and processing	6.4.7, 6.4.8, 8.2.1, 8.2.2
Production and processing maintenance	8.2.1, 8.2.2
Travel, transport and vehicles	8.2.11
Equipment failure	6.4.5.1
Chemical and fuel storage and handling	6.4.17, 8.2.2
Waste management	6.4.10, 6.4.13, 8.2.4
Communication	6.4.16
Resource requirements	6.4.14
Cold Venting	6.4.12, 8.2.10
Safety Control Systems	6.4.15
Produced water management	6.4.11, 8.2.3
Erosion sediment control	8.2.5
Decommissioning and Rehabilitation	11, 8.2.6
Not covered by FEMP	
Drilling of new wells	Separate EMP approval required
Hydraulic fracture stimulation	Separate EMP approval required
Clearing of new access roads or tracks	Separate EMP approval required
Disposal of a listed waste on-site	Separate EMP approval required
Clearing of undisturbed vegetation	Separate EMP approval required
Development of new groundwater wells	Separate EMP approval required
Establishing seismic lines or drill pads	Separate EMP approval required
Conducting seismic surveys	Separate EMP approval required

Earthworks that is not for road and access track maintenance/Civil maintenance	Separate EMP approval required
Construction of new pipelines or other facilities	Separate EMP approval required

6.4.5 A1 - Wells

Eleven wells have been drilled in the PVGF since 1965, six of which have produced gas for sale. An additional well, PV13 is currently under development and schedule to be on-line in 2019 (note: The well construction and connection are managed under a separate EMP and once complete the well will operate under this FEMP). Table 6-3 provides an overview of each well's location, cleared area and status.

Table 6-3 Overview of Wells Located in the PVGF

Well	Coordinates (GDA94)	Cleared Area (m^2)	Well Status (as of 12/2018)	Rehabilitation Status
PV-01	-23° 59' 55.531" S 132° 46' 15.955" E	5559	Currently shut in (16/01/2012) due to low demand. Available for production.	In production
PV-02	-24° 0' 3.952" S 132° 39' 3.485" E	14207	In production.	In production
PV-03	-24° 0' 19.388" S 132° 37' 5.351" E	6987	Shut In (1998) due to water loading	Well suspended –partially restored
PV-04	-23° 59' 11.285" S 132° 39' 4.211" E	3640	Cased and suspended as observation well – used as a re-injection well for produced water	Well reconfigured as a water re-injection well
PV-05	-24° 4' 5.414" S 132° 51' 18.486" E	10650	Cased and suspended as observation well – Located off the Palm Valley anticline	Well suspended – no restoration
PV-06	-24° 0' 4.841" S 132° 42' 25.029" E	5986	In production	In production
PV-07	-23° 59' 52.623" S 132° 43' 45.225" E	13672	In production.	In production
PV-08	-24° 0' 38.389" S 132° 47' 41.319" E	6658	Plugged and abandoned (P&A)	Full rehabilitation including access road
PV-09	-24° 0' 6.103" S 132° 41' 4.517" E	1794	Shut in (03/2010) – Available for production	Well suspended – partially restored including unused evaporation pond
PV-10	-23° 59' 7.393" S 132° 43' 7.964" E	3363	Cased and suspended as observation well	Well suspended – full restoration but access left for monitoring
PV-11	-24° 1' 0.635" S 132° 37' 19.409" E	5528	P&A	Partially restored land at request of Aboriginal Traditional Owners

Well	Coordinates (GDA94)	Cleared Area (m^2)	Well Status (as of 12/2018)	Rehabilitation Status
PV13	-23° 59' 35.280" S 132° 43' 33.420" E		Under development Scheduled to be on-line late 2018 or 2019	N/A

6.4.5.1 Well Facility Integrity and Maintenance Activities

All wells undergo an integrity survey and testing regime as per Table 6-4 below. The outcome of the integrity survey will initiate a review of the well integrity status and an appropriate risk assessment will be completed by senior CP management outlining if any additional actions are required. The integrity testing process and review as outlined is deemed sufficient to ensure well integrity is managed and the risk to the environment is kept at ALARP.

All other well testing and surveys (e.g. static gradient survey etc.) are conducted as per approved PV Reservoir Management Plan.

Table 6-4 Risk levels methodology

Level	Condition of Containment Barrier(s)	Action
1	As new with all required containment barriers tested and verified to be in place.	• Well integrity check every two years
2	Evidence of some degradation of any or both containment barriers.	• Well integrity check yearly
3a	Primary or secondary containment barrier has been removed by design (e.g. tubing punch to gas lift well). Remaining containment barrier intact.	• Monitor the well monthly utilising CP personnel • Well integrity checks yearly
3b	Primary or secondary containment barrier failed. Remaining containment barrier intact. Further assessment required. Condition requires attention.	• Monitor the well monthly utilising CP personnel • Well integrity checks yearly • Commence remediation planning within twelve months of risk assessment
4	Primary or secondary containment barrier failed. Remaining barrier suspect. Further assessment required. Condition unacceptable and requires immediate attention.	• Monitor well daily utilising CP personnel • Commence remediation planning within one month of risk assessment
5	Both primary and secondary containment barrier failed or unable to hold the required pressure. Condition unacceptable and requires immediate attention.	• Immediate Corrective action • Notification to NT DPIR as soon as possible

Note: that Level 3 wells are split into two categories to recognise that a number of wells have been designed or modified to have a single containment barrier which automatically designates them a Level 3 well. Such wells do not require remediation but will be monitored more frequently than wells on a lower risk level and are designated 3a. Wells designated 3b have a compromised containment barrier that was not planned or designed, and a remediation plan.

6.4.6 A1 - Gathering Systems

6.4.6.1 Well Heads

The raw gas from operating wells flows from the wellhead through a separator/filter coalescer where bulk liquids are removed under level control and particulate matter removed by the filter. Bulk liquids are discharged either into covered Polyvinyl Chloride (PVC) tanks or an evaporation pond (located adjacent to PV-09 well). Raw gas then flows through a control valve (choke) and orifice style flow meter prior to entering the gathering system. Each well is separated from the others by a non-return valve.

Each of the wells can be operated under flow control (flow limiting) or pressure controlled (wellhead pressure) to achieve overall control of field wide production for reservoir management purposes. Flow control set points, as determined by CP's reservoir management personnel, are implemented via adjustment of telemetry system controls which automatically adjust choke settings.

Until 2001, the prevention of hydrate formation within the gathering system required the injection of tri-ethylene glycol (hydrate inhibitor) at the wellhead. This was achieved via a glycol injection pump at each well which was fed by a small glycol storage tank which was routinely filled by the operator. The current low gathering system pressures make the formation of hydrates very unlikely, so glycol injection is no longer required and the wellhead glycol injection equipment has been decommissioned and removed from site.

Each wellhead is equipped with an instrument gas supply and reticulation system which consists of a calcium chloride dryer, filter and pressure regulation to allow conditioning of raw gas to a quality and pressure which is suitable for the pneumatic instruments and valving located at the wellhead. Operation of the wellhead systems are regularly attended for basic operational checks including data collection and periodic visits associated with routine maintenance and calibration, monitoring / change-out of filters, replacement of calcium chloride and waste water monitoring / disposal.

Wellheads are accessed via unsealed roads which generally follow the route of the gathering system flowlines.

6.4.6.2 Gathering Network

Each producing well is connected to the CCS by an in-field gathering system of pipelines as shown on Figure 6-1. The pipelines range in diameter from 75 mm to 200 mm and are all located above ground. Generally, the gathering system is adjacent to the road network.

The gathering system and compression facilities generally consist of above ground flowlines as pictured in Figure 6-5, pipelines, pig launchers and receivers.

Figure 6-5 Typical flowline and associated pipe stands at PVGF

The raw gas from each of the wellhead skids flow into gathering system pipe headers (gathering lines) via short flowlines. The gathering lines are provided with pig launchers and receivers. The gathering lines are manifolded together and then enters the CCS.

The pressure into the gathering system is limited by the wellhead choke and the wellhead Surface Safety Valve (SSV) to below the gathering system Maximum Allowable Operating Pressure (MAOP).

6.4.7 A2 – Central Compression Station (CCS)

6.4.7.1 Slug Catcher

The purpose of the slug catcher is to prevent large volumes of free liquid entering the compressor manifolds and flooding the compressor suction scrubbers.

Raw gas from a gathering line manifold at well PV-02 flows into the CCS slug catcher whereupon free liquids separate and are removed under level control into the closed drain system.

Liquid removed from the gas is drained to a degasser, where water is separately drained to a grey water tank.

6.4.7.2 Compression

The CCS is located adjacent to PV-02 well (Figure 6-2). The gas from the slug catcher enters the low-pressure header at the CCS. Central compression consists of five reciprocating engine driven gas compressors.

The compressors are interconnected through valving to low pressure headers, and medium pressure and high-pressure headers that are configured to allow parallel and series connection of the compressors. Raw gas entering the units from the low-pressure header is compressed and discharged into the medium pressure header.

Control of the CCS and hence control of CTP feed conditions (pressure and flow) is achieved via automatic control of compressor speed.

Conditioned gas for fuel, compressor start-up and instruments are reticulated to the compressor units from the CTP.

6.4.7.3 Filter Coalescer

The gas outlet from the CCS passes through the filter coalescer located within the CTP area. The purpose of this vessel is to separate and filter any entrained liquids and other contaminates from the process fluids prior to entering the CTP. These products are processed through the grey water system, oils are removed for load out and the water is filtered and tested for salinity and hydrocarbons. If within specification, the water is then reused and sprayed onto the roads for dust suppression. If large accumulations of lubricating oils are allowed to enter the glycol dehydration system these can potentially inhibit system performance and possibly lead to foaming in the dehydration system.

6.4.8 A3 - Central Treatment Plant

The CTP generally consists of glycol dehydration plant equipment, separation, heating and cooling, reticulated pipe-work, controls, utilities systems and support infrastructure, including office, control room, maintenance workshop and accommodation-messing (Figure 6-3). The plant is immediately adjacent to the export pipeline's end of line facilities. The office, workshops and accommodation block are located adjacent to the gas plant.

The CTP is equipped and configured to provide for treatment of process gas which essentially requires the removal of water and impurities to achieve export quality sales gas suitable for transport and reticulation in the export pipelines. Primary water removal systems involve the utilisation of glycol dehydration units which allow the process fluids to contact glycol which absorbs the water vapour in the gas.

6.4.9 A4 - Export Facilities

The sales quality gas flows from the CTP to the sales gas metering skid. The metering skid consist of a moisture analyser located immediately downstream of the filter coalescer units and two export gas meter runs, one each for the Amadeus Gas Pipeline (AGP) and the Alice Springs Pipeline.

Metering for the AGP export lines is performed using a removable orifice plate assembly and a dual range pressure transmitter which feed a flow computer. The flow is both pressure and temperature compensated and used as check metering for the APA Group fiscal metering system in the adjacent APA Group compound.

Gas to the Alice Springs Pipeline was formally metered using two parallel meter runs utilising removable orifice plate assemblies and feed the flow computer. The Alice Springs Pipeline export gas meter runs are no longer in use. Gas into the Alice Springs Pipeline is managed by the APA Group through a downstream interconnector on the AGP.

The custody transfer point from CP to the AGP is the pipe flange located immediately on the APA Group side of the APA Group compound at the CTP entrance gate.

The export pipelines in the APA Group compound generally consist of end of pipeline facilities, including production metering, pressure regulation, pig launchers and then buried pipelines. These facilities are operated and maintained by the APA Group.

6.4.10 A5 - Waste Water

An overview of the waste water process is illustrated in Figure 6-6. The waste water system consists of the following elements;

- Industrial water:
  - produced water generated during the compression process
  - produced water from the glycol dehydration process and,
  - produced water from the coalescer filters
- Grey water:
  - water generated from the wash down pads
- Stormwater:
  - water collected from the compressor skids at the CCS and process equipment at the CTP.
  - stormwater not captured by the processing equipment moves across the site and flows to the natural contours

The largest contributor to the waste water system is rainwater collected from the compressors skids. The volume is highly variable throughout the year due to rainfall being the largest contributor. It is estimated that the average daily production of gray water will be less than 1000l/day

The waste water system consists of the grey water tank with a capacity of 45,000 litres, a filter and the process water tanks with a combined capacity of 90,000 litres. The purpose of the system is to remove as much of the entrained oil and salt in the waste liquids as possible prior to disposal of the waste liquids.

Once treated the waste water is disposed of through a licenced waste water carrier to a licensed waste water facility.

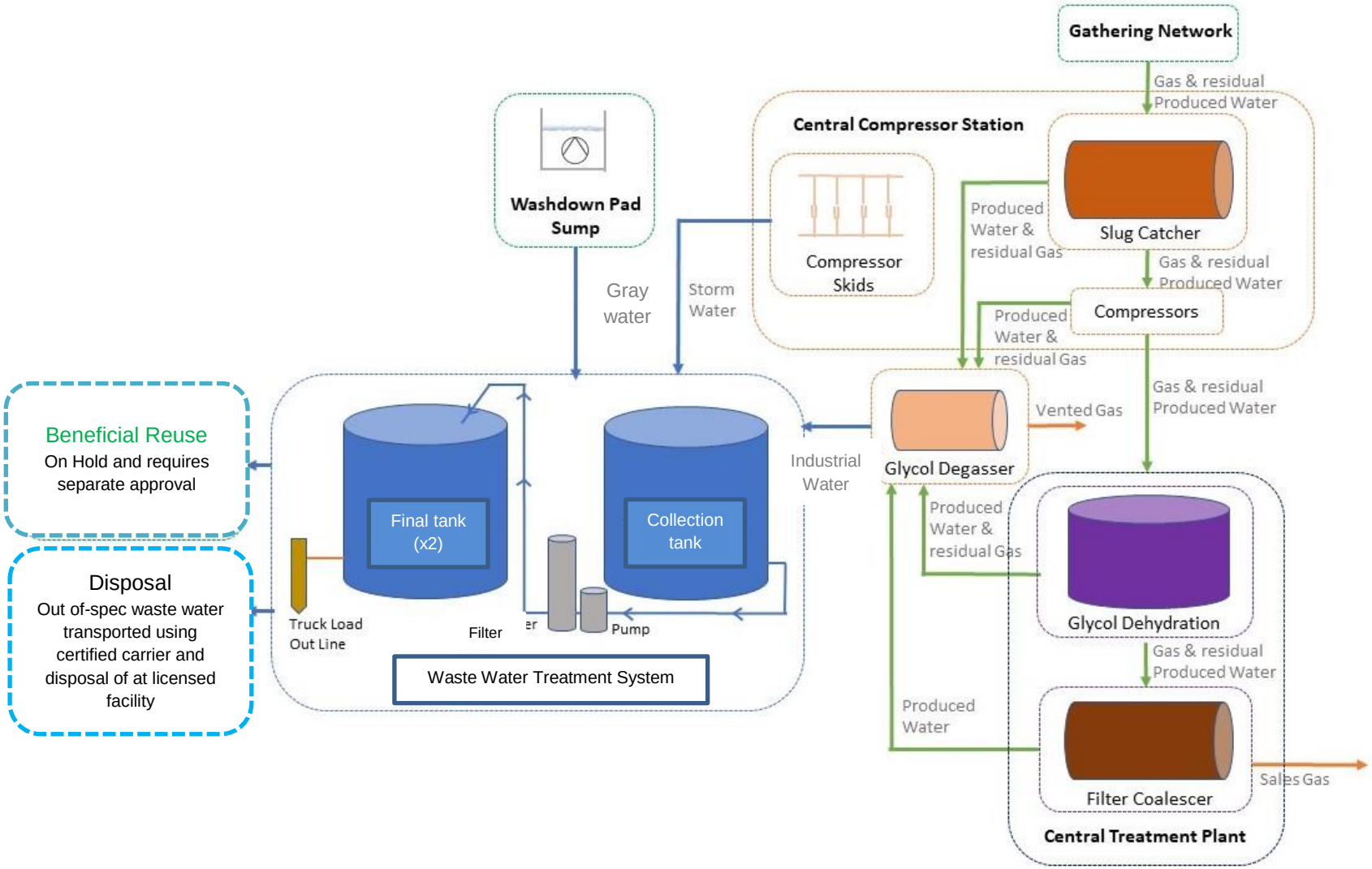


Figure 6-6 Palm valley gas field waste water process diagram

6.4.11 Produced Water

Produced brackish/saline water is separated from the gas stream at each well head, and stored on the field whether at water storage tanks located at the well sites. The basic produced water quality from the PVGF is described in Table 6-5.

Table 6-5 PVGF Produced Water Quality

Water Analysis	Unit	PV-07	PV-02
pH	°C	5.5	6.5
Electric Conductivity	µS/cm	18,000	12,000
Resistivity	M.Ohm	0.56	0.83
Anions			
Chloride	mg/L	6,300	4,400
Nitrate	mg/L	<0.1	<0.1
Sulphate	mg/L	<0.1	6
Cations			
Potassium	mg/L	110	61
Sodium	mg/L	2,700	1800
Calcium	mg/L	650	530
Magnesium	mg/L	90	66
Lithium	mg/L	2	1

Note : Samples are analysed by a 3rd party NATA accredited laboratory. Samples from July 2015

The produced water is slightly acidic, has high salinity, which also supported by high levels of Sodium and Chloride. The produced water if not managed appropriately has the potential to become a risk to the environment.

The volume of produced water extracted historically from PV01, PV02, PV06, PV07 was approximately 19,000 L/day on average (peak water rate was 58,000 L/day (including PV09)) and is expected to rise over the remainder of the life of the field. This rate is also variable depending on which wells are online, some wells produce more water than others. The water produced at PVGF has been effectively managed over the 30+ life span of the operations. An overview of the produced water management is illustrated in Figure 6-7.

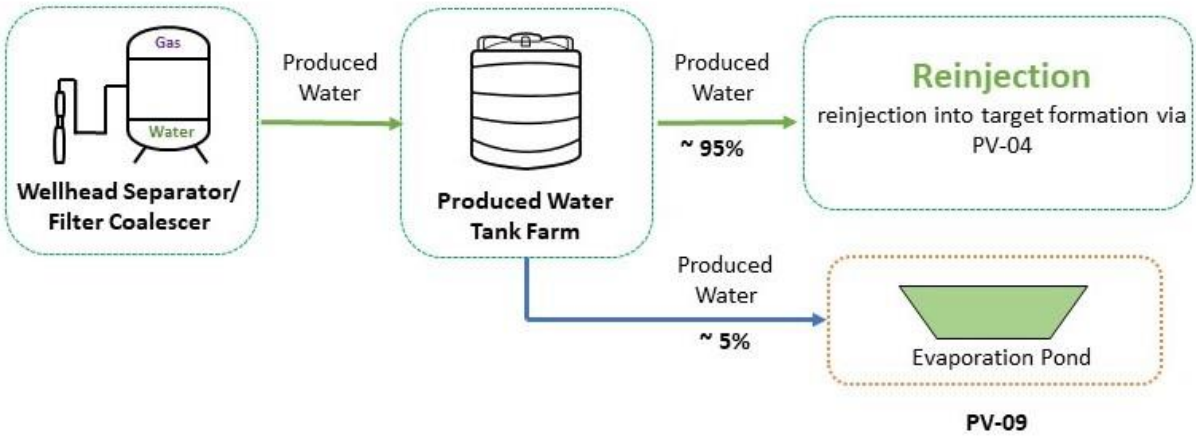


Figure 6-7 Palm valley gas field produced water process diagram

Produced water is brought to the surface and separated from the gas and placed in tank farms at each wellsite. The tank farms are sized to each provide approximately 1.5 days of storage, this provides buffer storage prior to the produced water management scenario. The water management at PVGF is hierarchal, operations proceeds to manage produced water as follows:

1. Produced water reinjection at PV-04, into the target reservoir. This not only manages the water, but it's main objective is to increases the pressure of the reservoir for production. This produced water management measure has a capacity of 67,000L per day, which manages the bulk of the water produced at PVGF (further details in section 6.4.2.1).
2. Evaporation pond at PV-09 is the second produced water management option. The evaporation pond is utilised when produced water production is above the capacity of PV-04 reinjection or PV-04 is not available due to maintenance. The evaporation pond is managed not to exceed 200mm freeboard (further details in section 6.4.2.2)
3. The last option is to transport produced water to a licenced facility to dispose of the produced water. This option is only utilised if capacity of the first two options is compromised. CP will assess this option against reducing production to manage produced water.

6.4.11.1 Produced water reinjection

Reinjection occurs via the former depleted production well PV-04 into the Pacoota 1 Formation approximately 2,523 m below surface, which is separated from any beneficial groundwater sources by the low permeability Stokes Siltstone Formation as illustrated in **Figure 6-8** (also see Section 5.1.9). This represents a true produced water reinjection programme whereby the Pacoota Formation is also the target reservoir for gas production. The reinjection of the produced water from the remainder of the field into PV-04 may provide enhanced sustainability of the field by increasing production rates and prolonging the life of the field.

Therefore the reinjection scheme involves the return of produced formation water back into the same geological formation (reservoir). The basic produced water chemical composition is shown in the previous section, but may vary over the life of the field. There is likely to be some losses of any solids and flocculation of dissolved solids into the storage tanks upon exposure to oxygen, much of which will be removed from the produced water stream and won't return to the reservoir.

The only additives to the natural produced water stream are a tracer (lithium chloride) which is used for monitoring reservoir hydrodynamics and managing injection efficiency, and a biocide and oxygen scavenging compound essential for reducing the risk of corrosion and build-up of scale in wells and pipework. The dosing rates for these compounds are discussed below.

A produced water quality monitoring programme to test for lithium chloride and monitor trends in produced water chemical constituents is currently in place.

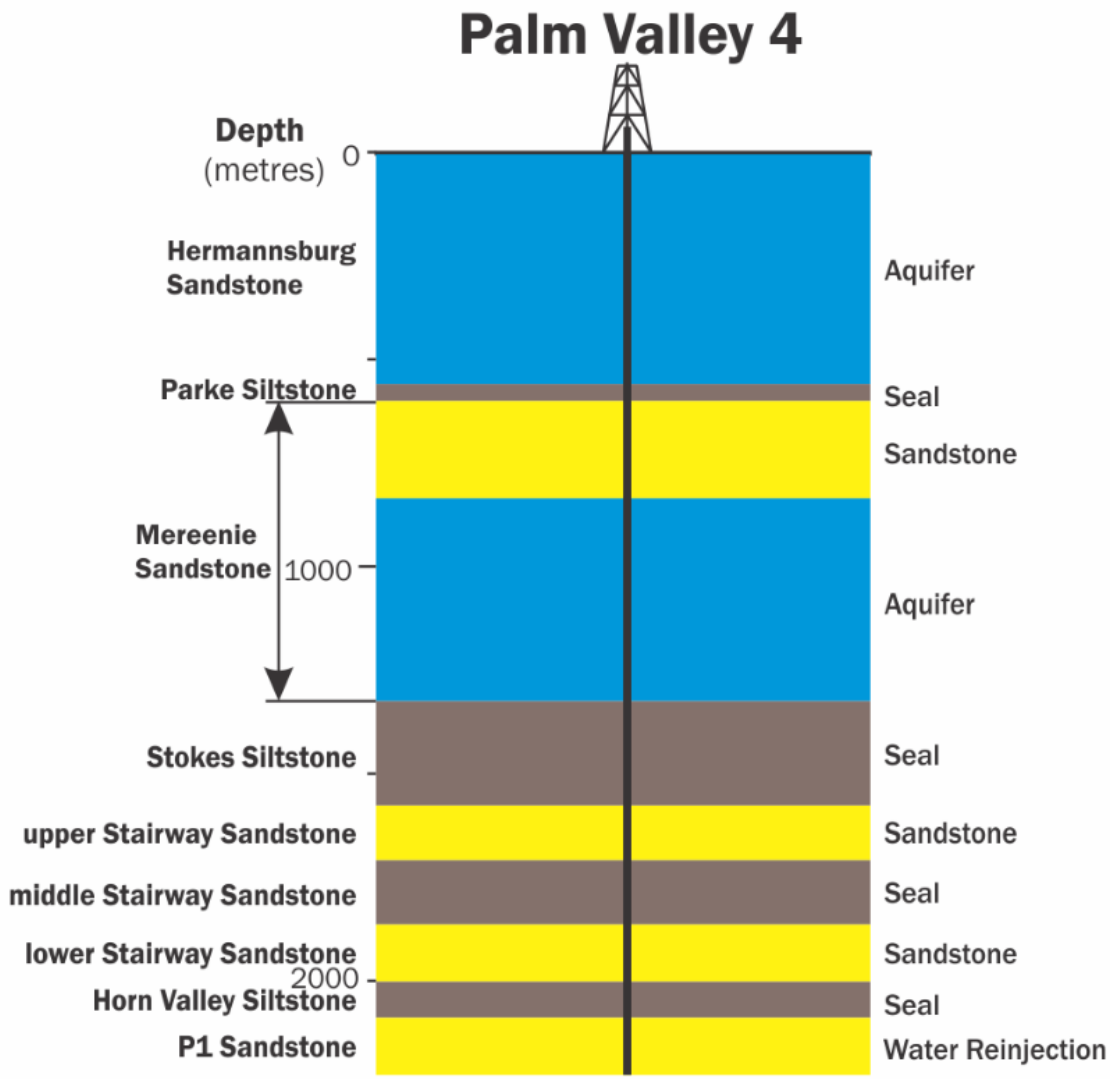


Figure 6-8 Palm Valley 4 cross section of stratigraphy

Reinjection of produced water into PV-04 well commenced with the approval of the NT DPIR in April 2004. Since that time no environmental incidents associated with the operations of reinjection have occurred.

A recent upgrade to the reinjection system has been completed. The reinjection skid is now located at PV-02 and the existing pipeline is utilised to transfer the treated water to PV-04. The new system involves increasing the wellhead injection pressure using high and low pressure pumps to a maximum of 800psi, thereby increasing the potential reinjection capacity to 67,000 L/day.

The maximum wellhead injection pressure has been selected to protect the reservoir formation from over pressuring. To ensure this, the maximum well shut in pressure for PV-04 should not exceed a 1000 psi. This will be managed by the low pressure pump design not exceeding the 800 psi delivery pressure.

The new reinjection system includes a tank farm at PV-02 with four HDPE tanks to store approximately 100kL of produced water, equivalent to approximately 1.5 days of produced water collected from all PVGF wellheads.

Prior to reinjection, produced water is treated with biocide, scale inhibitor and tracer chemicals. Injection of biocides is batch dosed for 10min per hour at a rate of 1000mg/L and the antiscalant and oxygen scavenger is continuously dosed at a rate of 60mg/L. Injection of a lithium chloride tracer will be completed annually at a rate of 1000mg/L over a period of 4 days. These chemicals are self bunded and stored at the facility. Storage is considered to be minor storage under the applicable Australian Standards.

The specific dosed products and their chemical constituents summarised from the material safety data sheets (MSDSs) are:

Nalco Champion SICI18140A: Corrosion/Scale Inhibitor:

Chemical Name	CAS-No.	Concentration: (%)
Ethylene Glycol	107-21-1	5 - 10
2-Mercaptoethanol	60-24-2	5 - 10
Sodium Hydroxide	1310-73-2	1 - 5

Nalco Champion Bactron AUK-550 (CHP917408): Biocide:

Chemical Name	CAS-No.	Concentration: (%)
Tetrakis(hydroxymethyl) phosphonium sulfate	55566-30-8	60 - 100
Sodium Hydroxide	1310-73-2	1 - 5

Lithium Chloride: Tracer:

Chemical Name	CAS-No.	Concentration: (%)
Lithium Chloride	7447-41-8	100

Depending on availability, the above products may be replaced with other similar products.

As well as being diluted in the gas reservoir, the majority of these chemicals have a relatively short half-life. For example, Ethylene glycol does not persist in large amounts in ambient air because breakdown is rapid (half-life in air is 8-84 hours). In environmental exposure situations, its low vapor pressure precludes substantial inhalation exposure at ambient temperatures, and its poor skin absorption prevents significant absorption after dermal contact. Ethylene glycol is miscible with water and it biodegrades rapidly in soil (half-life, 2-12 days). The half-life ranges from 2-12 days in surface water and 4- 24 days in ground water. Because it is not fat soluble and biodegrades rapidly, bioconcentration and bioaccumulation are insignificant (Agency for Toxic Substances and Disease Registry 1997).

Sodium hydroxide (caustic soda) is used in food preparation soaps, detergents and cosmetics.

These chemicals provide protection to the integrity of injection well PV-04 as well as other wells producing from the reservoir formation, with low risk to any environmental receptors due to the depth, access and dilution factor within the reservoir, as well as the half-life of the chemicals.

6.4.11.2 Produced water evaporation at PV-09

The evaporation pond at PV-09 pictured in **Figure 6-9** has been in service since 2000. The evaporation pond is double lined with a leak detection system and a leak collection system. The leak detection system consist of a primary and a secondary liner. The design is such that any liquid that passes through the primary liner gets collected between the primary and secondary liners and drains into a separate poly tank situated on the side of the pond below the water level. The liquid collected in the tank is returned back into the pond via a pump. The volume of liquid collected is monitored and used as an indicator of primary membrane integrity.

The built capacity of the evaporation pond is 5.77ML. CP operates the evaporation pond with a minimum of 200mm freeboard to account for a 24-hour storm event (1 in 100-year ARI). The freeboard level is indicated by a surveyed marker at the lowest point on the inside of the pond wall.

Figure 6-9 Photograph of PV-09 facility

The PV-09 evaporation pond is the secondary management option for produced water and is utilised when the capacity of the reinjection system is not available or produced water production exceeds the reinjection system capacity.

At the end of the PV-09 evaporation facility life an assessment will be completed to properly decommission and rehabilitate the area to the satisfaction of the Department and landowners.

6.4.12 Cold Venting

Flaring is not undertaken at the PVGF. Cold venting may occur:

- during emergency shut-down of the gas plant,
- during start-up of the gas plant,
- where there is out of spec gas (to bring gas back into spec),
- remedial work on an individual well.

Cold venting will be undertaken in accordance with Section 419 of *Schedule of Onshore Petroleum Exploration and Production Requirements 2017*.

CP records and reports emissions in association with cold venting in the annual NGRS and NPI reporting.

6.4.13 Wastes - Output

There are four main waste streams associated with the PVGF:

- Produced formation water (Section 6.4.10);
- Waste/Grey water (Section 6.4.9)
- Produced gas (Section 6.4.11); and

- Camp, office, operations and workshop miscellaneous wastes

Waste management at the PVGF aims to reduce waste production through avoidance, reuse, recycling and recovery. All personnel look for ways of reducing waste at the source whenever feasible. Good housekeeping practices assists in preventing litter and minimising leaks and spills.

Table 6-6 is a summary of the miscellaneous waste generated from the PVGF. Section 8 provides more detailed in regard to waste management measures.

Table 6-6 Miscellaneous Waste Streams Generated at the PVGF

Waste	Examples at the PVGF	Storage and Disposal
Domestic	General waste consists of all domestic, office waste, and other solid workshop refuse including: • Drained oil filters; • Scrap metal (including clean, empty used drums); • Plastic; • Glass; • Aluminium cans; • Paper and cardboard; • Organic wastes.	General waste, particularly putrescible waste, is stored in predator proof receptacles with secure, fit-for-purpose lids. General waste is regularly removed off-site and disposed of at the local licenced waste management facility. Cans and bottles are stored in IBC bins and transported on an as needs basis to the Alice Springs Recycling Depot. Paper, cardboard and plastics are stored on site in skip bins and transported to JJ Richards at Alice Springs. Batteries are stored on pallets onsite and taken to a recycling depot at Alice Springs. Steel and scrap metal is stored in skip bins and taken to JJ Richards – Alice Springs for recycling/reuse.
Listed Wastes	• Waste oils, oil filters, soiled rags • Soils contaminated with oil or chemical • Containers contaminated with an oil or chemical • Waste mixtures or waste emulsions of oil and water or hydrocarbon and water; • Grey water that cannot be treated to the standard required for dust suppression	Waste oils, oil filters and oil contaminated soils are stored in IBC bins and transported to a licenced facility (JJ Richards at Alice Springs) Waste chemicals/containers with residual waste chemicals are stored in IBC in the chemical storage shed. These are removed from site on an ad-hoc basis by a licenced waste transporter to a licenced facility. Out-of-spec waste water with TPH and salinity concentrations above limits is taken by truck directly from the onsite storage tanks by a licenced transporter to a licenced facility in Darwin, Alice Springs or Adelaide depending on the level of contamination.
Sewerage	• Effluent from camp and offices • Sewerage sludge and residues including nightsoil and septic tank sludge	The existing septic system relies on anaerobic activity and is used to store and treat sewage at the camp site. Liquid effluent from the septic tank flows through a rubble drain in a benign area.

		The remaining tank contents are pumped and removed (as required) by a licenced waste contractor to the nearest licenced waste management facility.

6.4.14 Resource Requirements

Potable water and power are required to maintain operations at the PVGF in full production. No surface or groundwater or groundwater sources is used at Palm Valley.

6.4.14.1 Potable Water

Potable water and power are required to maintain operations at the PVGF in full production. Potable water for accommodation/messing and operations is trucked in from Alice Springs. This water is stored on-site in three separate purpose-built tanks. Potential rain water is stored on-site which is used, when available, to supplement the potable water supply. All pumping, storage and delivery systems for potable water on-site is regularly maintained and inspected by the site Supervisor, CP's environmental engineer and external third-party auditor during environmental surveys/inspections.

6.4.14.2 Power Wellheads

The remote wellheads at the PV-01, PV-06, PV-07 and PV-09 wells are currently powered from 24V DC solar panels located adjacent to the wellhead controller with battery backup. The solar units and batteries are designed to provide power during the event of no sun for a minimum of 10 days.

PV-02 well is powered from the CTP generators.

6.4.14.3 Power CCS and CTP

The CTP has a power generation facility consisting of three gas driven engine/generators. The units are in the generator enclosure at the CTP southern gate in a common bunded area. Generator units #1 and #2 are nominally 55kW and unit #3 is nominally 110kW, all at 3 phase 415VAC.

The units are controlled from a Generator Switchboard located in the switch room adjacent to the generator enclosure.

The units are fueled from the CTP fuel gas system. The CTP fuel gas system takes dehydrated sales (export) gas and regulates and filters it down to fuel gas pressure. The fuel gas is distributed around the CTP for instrument gas and fuel gas in the glycol reboilers, to CCS for instrument gas and compressor start gas/fuel gas and to PV-04 well reinjection facility for instrument gas and pneumatic pumps (as required).

6.4.15 Safety and Control Systems

The PVGF has safety and control systems in place:

- Process Safeguarding;
- Containment;
- Detection and Emergency Shutdown/Venting (ESD) System;
    - Palm Valley CTP ESD System
    - Palm Valley CCS Area (PV-02 well area) ESD System
- Overpressure; and
- Fire Protection/Extinguishment.

A detailed explanation of each is provided in CP's Palm Valley Operations Manual (OPSMAN).

6.4.16 Communications

6.4.16.1 Voice and Data Communications

The communications systems at Palm Valley consist of a primary and secondary internet link in which both data and telephony operate over. Palm Valley is also able to receive a 3G signal for mobile phone services in and around the camp (provided they are with Telstra). In addition, CP operates a VHF radio communication system that services local voice contact with field operations personnel and the plant, including broadcast of selected alarms.

6.4.16.2 SCADA/Telemetry System

The Supervisory Control and Data Acquisition System (SCADA) provides monitoring of both CTP and wellhead process parameters, as well as the ability to affect the gas flow control from the wells or the gas compressors located at CCS.

In general, all operating parameters are available and displayed live on graphical screens on the control room computer with the data being updated every 90 seconds on average. In addition to this monitoring role, the operator can also increase or decrease the gas flow rate from any of the wells or from the compressors by adjusting suction/discharge pressure set points for the automatic speed control of these units.

Each morning at 08:00 hours the SCADA system generates three hard copy reports which provide summaries of field, compressor(s) and plant production for the past 24 hours.

More details on this system are provided in the CP OPSMAN.

6.4.17 Chemicals and Hazardous Materials

All chemicals and hazardous substances are managed in accordance with CP's Chemical and Hazardous Materials Management Procedure (Document MSTD11-PC002). A Hazardous Chemical Goods Register (HCGR) is kept for all sites and facilities operated by CP. It details:

- Product Name;
- Substance Name;
- Storage Locations;
- Current MSDS;
- Hazardous Goods (Yes/No);
- Dangerous Goods (Yes/No);
- Class & Packing Group;
- Quantity;
- Risk Assessment;
- Comments (Use, if still holding etc.)

A copy of the current HCGR for PVGF contains all the products that are stored and or used in the PVGF operations; a copy is provided in Appendix 8.

Chemicals and other hazardous substances are stored in accordance with the requirements of their relevant SDS (previously MSDS). SDS's for each chemical used and stored onsite are held in the site office.

Purchasing, storage, handling and disposal of chemicals and hazardous substances will comply with the provisions of explosives and dangerous goods and health and safety legislation as well as codes of practice (Storage and handling of dangerous goods NOHSC: 2017 (2001)) and Australian standards (AS3780-2008, AS 1940:2017 and AS/NZS 3833:2007).

6.4.18 Roads and Access tracks

The roads and access tracks that are owned and operated by CP are maintained to ensure safe access to the facilities in all weather. Maintaining CP road and tracks includes:

- Grading the road to fix potholes and rough areas,
- Clearing culverts,
- Cutting back vegetation that encroaches on the road, and
- Dust suppression

Erosion and sediment controls are in place and maintained along roads and access tracks.

7 ENVIRONMENTAL RISK ASSESSMENT

7.1 Central Petroleum's Risk Management Approach

Central Petroleum ensures that risks to its business are systematically managed. Risks associated with all aspects of company operations will be:

- Identified
- Analysed and evaluated
- Entered into a suitable Risk Register (as appropriate)
- Treated in a manner commensurate with the level of risk (formal risk management plans, detailed risk treatments, routine management)
- Communicated to key stakeholders
- Monitored and reviewed in a manner commensurate with the level of risk, and the retained consequences

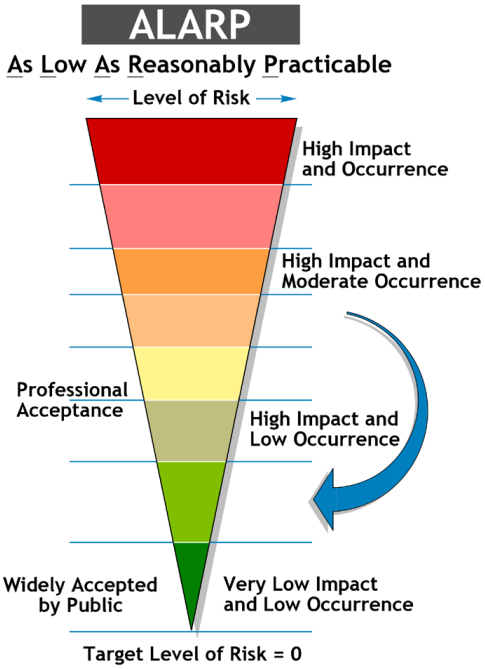
Risk management processes are mandated through the CP management system, which includes a risk analysis process (Figure 7.1). The CP risk analysis process complies in all material aspects of ISO 31000 and addresses risk identification, assessment and management.

Assessment of risk are completed using CP's Risk Matrix (Figure 7-1) to assess and rate risks by assessing the combination of frequency of occurrence and the severity of the outcome of an event. This allows quantification of the risk and determination can then be made about whether the risk can be accepted, or whether further mitigation is required.

CP's risk management processes requires regular review of unmitigated risk from an activity, the residual risk once controls are applied and the likelihood and consequence of a risk event. The review includes the effectiveness of the risk controls/mitigation measures to meet CP's objective of ALARP. The CP Operations Manager is the owner of the risks associated with PVGF operational activities and is responsible for risk acceptance.

7.2 ALARP and Risk Acceptance

As part of CPs risk assessment process, each risk is mitigated to ALARP. A risk can be considered to have been reduced to ALARP when all reasonably practicable control measures have been identified and implemented to reduce the risk of identified hazards. As described in numerous ALARP guidance documents, ALARP is demonstrated when good practice is followed, where good practice is defined as the recognised risk management practices and measures that are used by competent organisations to manage well understood hazards arising from their activities. ALARP is not a final position over the life of an asset or project.



As part of CPs risk process, risk acceptance is completed following each ALARP assessment. CPs risk acceptance considers the impact of the hazard on the environment (nature and extent), the overall social or economic benefits of the operation, feasibility of new technologies, and effectiveness of the mitigation measures to achieve the outcomes and do the mitigation measures meet the expectations of the community

It is important to note when discussing ALARP and risk acceptance that practicability and the reasonability of control measures can change over time due to changes in technology, industry standards and community acceptance.

7.3 Scope

The environmental risk assessment (ERA) is based on hazards identified over the whole of site activities detailed in Section 6 and shown in the CSM (Figure 6-4).

7.4 Cumulative Impacts

Due to lack of surrounding developments and the Finke Gorge National Park and MacDonnell Ranges National Park to the north and south limiting further development in the area, cumulative impacts related to the PVGF operations are low and not considered a hazard for the purposes of the ERA.

The community at Hermannsburg has a small population and limited infrastructure, with a majority of services provided in Alice Springs. The cumulative impacts of PVGF will be re-assessed if there are any major future developments in the area.

7.5 Professional and Stakeholder Engagement

This ERA has been developed based on a collaborative and iterative approach. Specialists from respective fields and impacted stakeholders have been consulted throughout the process in order to develop the most practical and realistic assessment of potential environmental risk at the PVGF and the relative impact of mitigation and preventative measures proposed. The following is an acknowledgement of all groups involved in the ERA process:

- Department of Primary Industry and Resources
- Land Council – Central Land Council
- Traditional Owners:
- Low Ecological Services
- Local Environmental Consultant and local pastoralist
- Enviro-Value Pty Ltd.
- Key CP personnel

7.6 Risk Assessment

Detailed ERA utilising the CP methodology.

Figure 7-1 Risk analysis process and risk raking matrix used for the PVGF ERA

Risk = Consequence X Likelihood

The fundamental rule is to define the consequence first, as different consequences have different likelihood.

Likelihood	Consequence				
	1 - Minor	2 - Medium	3 - Serious	4 - Major	5 - Catastrophic
A - Almost Certain	Moderate	High	Critical	Critical	Critical
B - Likely	Moderate	High	High	Critical	Critical
C - Possible	Low	Moderate	High	Critical	Critical
D - Unlikely	Low	Low	Moderate	High	Critical
E - Rare	Low	Low	Moderate	High	High

Note: All risks that have a Critical risk classification from a qualitative analysis (using the risk determination matrix) must be re-evaluated using a Level 3 quantitative analysis.

*Special attention needs to be paid to any risks assessed as having a very high consequence but very low likelihood (e.g. multiple fatalities, catastrophic chemical release causing severe public health affects or environmental harm). They should be treated as special cases and only referred for Level 3 assessment if event is deemed credible.

Maximum Reasonable Outcome (MRO)

The MRO is based on the maximum reasonable consequence and the likelihood of that consequence occurring.

The maximum reasonable consequence is the largest realistic or credible consequence from an event, considering the credible failure of controls.

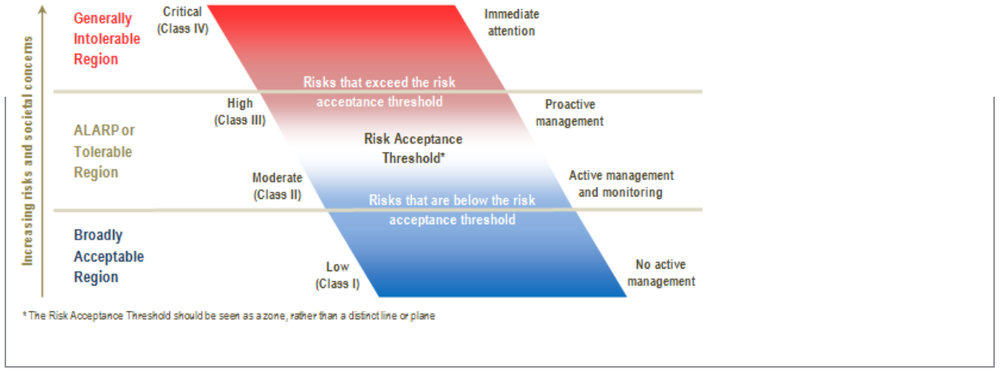
It is generally a higher consequence than the “most likely” consequence and less severe than the “worst case” consequence, which considers the failure of all controls.

Likelihood Descriptors

Likelihood	Likelihood description	Frequency	Substance Exposure
ALMOST CERTAIN	Recurring event during the life-time of an operation / project	Occurs more than twice per year	Frequent (daily) exposure at > 10 x OEL
LIKELY	Event that may occur frequently during the life-time of an operation / project	Typically occurs once or twice per year	Frequent (daily) exposure at > OEL
POSSIBLE	Event that may occur during the life-time of an operation / project	Typically occurs in 1-10 years	Frequent (daily) exposure at > 50% of OEL Infrequent exposure at > OEL
UNLIKELY	Event that is unlikely to occur during the life-time of an operation / project	Typically occurs in 10-100 years	Frequent (daily) exposure at > 10% of OEL Infrequent exposure at > 50% of OEL

Risk Acceptance Threshold

- Low (Class I): Risks that are below the risk acceptance threshold and do not require active management.
- Moderate (Class II): Risks that lie on the risk acceptance threshold and require active monitoring.
- High (Class III): Risks that exceed the risk acceptance threshold and require proactive management.
- Critical (Class IV): Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention.



Consequence Descriptors

Consequence	MINOR	MEDIUM	SERIOUS	MAJOR	CATASTROPHIC
Non-Economic (Social And Environmental)					
HEALTH (employees, contractors or public)	Reversible health effects of little concern, requiring first aid treatment at most. Can include minor irritations of eyes, throat, nose and or skin, or minor unaccustomed muscular discomfort.	Reversible health effects of concern that would typically result in medical treatment. Can include temperature effects; travel effects; stress; and sunburn.	Severe, reversible health effects of concern that would typically result in a lost time illness. Can include acute / short-term effects associated with extreme temperature effects; or musculo-skeletal effects; vibration effects; nervous system effects; some infectious diseases; and non falciparum malaria.	Single fatality or irreversible health effects or disabling illness. Can include effects of suspected carcinogens, mutagens, teratogens and reproductive toxicants, progressive chronic conditions and/or acute / short-term high-risk effects.	Multiple fatalities or serious disabling illness to multiple people. Can include effects of known human carcinogens, mutagens, teratogens and reproductive toxicants, and life-threatening respiratory sensitisation and falciparum malaria
SAFETY (employees, contractors or public)	Low level short term subjective inconvenience or symptoms. Typically a first aid injury and no medical treatment.	Reversible injuries requiring treatment, but does not lead to restricted duties. Typically a medical treatment.	Reversible injury or moderate irreversible damage or impairment to one or more persons. Typically a lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons.	Multiple fatalities or permanent damage to multiple people.
ENVIRONMENT (on site)	Near-source confined and promptly reversible impact (typically a shift).	Near-source confined and short-term reversible impact (typically a week).	Near-source confined and medium-term recovery impact (typically a month).	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically years).	Impact that is widespread-unconfined and requiring long-term recovery, leaving major residual damage (typically years).
(off site)	Not applicable.	Near-source confined and promptly reversible impact (typically a shift).	Near-source confined and short-term reversible impact (typically a week).	Near-source confined and medium-term recovery impact (typically a month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically years).

Economic (Operational)					
Catastrophic					Financial loss in Excess of $50 Million
Major				Financial loss $10 Million to $50 Million	
Serious			Financial loss from $1.0 Million to $10 Million		
Medium		Financial loss from $0 to $1.0 Million			
Minor	Minor equipment damage / no delay in operations				

Consequence	MINOR	MEDIUM	SERIOUS	MAJOR	CATASTROPHIC
Non-Economic (Social And Environmental)					
COMMUNITY (community trust)	Tangible expressions of trust / mistrust amongst a handful of community members with no influence on public opinion and decision-makers.	Tangible expressions of trust / mistrust amongst a few community members with some influence on public opinion and decision-makers.	Tangible expressions of trust / mistrust amongst some community members with moderate influence on public opinion and decision-makers.	Tangible expressions of trust / mistrust amongst most community members with significant influence on decision-makers.	Widespread loss / gain of trust across the community setting the agenda for decision-makers and key stakeholders.
COMMUNITY (stakeholders)	Key civil/political stakeholder(s) express support / dissatisfaction informally.	Key civil/political stakeholder(s) express support / dissatisfaction formally.	Key civil/political stakeholder(s) threaten to oppose or disengage / strengthen offers to support or engage.	Key civil/political stakeholder(s) actively oppose or actively refuse to engage / actively support and engage.	Key civil/political stakeholder(s) oppose and actively get others to oppose / engaged and actively get others to support.
COMMUNITY (cultural heritage)	Reparable damage to site or item of low cultural significance.	Irreparable damage to site or item of low cultural significance.	Repairable damage to site or item of cultural significance.	Irreparable damage to site or item of cultural significance.	Irreparable damage to site or item of international cultural significance.
REPUTATION	Community complaint resolved via existing site procedures. Impact on reputation of several work areas within an operation. One off public exposure in local media, word of mouth or local mythologies.	Impact on reputation of Central Petroleum . Significant public exposure in local media.	Impact on reputation of Central Petroleum. Comment from national NGO which impacts credibility with neighbours / regional government. Public exposure in national media.	Impact on reputation of Central Petroleum. Comment from international NGO. Public exposure in international media.	Severe impact on reputation of Central Petroleum. Severe prolonged comment from international NGO. Greater than three year's public exposure in international media.
CONFORMANCE /COMPLIANCE	Non-conformance with internal requirement with very low potential for impact. Non-compliance with external / community commitment goes unnoticed by external party/parties, requiring minimal effort to correct.	Non-compliance with external or non-conformance with internal requirement with low potential for impact. Non-compliance with community commitment, requiring limited effort to correct.	Non-compliance with external or non-conformance with internal requirement with moderate potential for impact. Moderate penalties for breach of legislation, contract, permit or licence. Non-compliance with community commitment reported formally, requiring significant effort to correct.	Breach of licences, legislation, regulation or repeated non-compliance with high potential for prosecution. Breach of contract with significant penalty clauses imposed. Systemic non-conformance with Rio Tinto work cycles or standards with high potential for impact. Breach of community commitment with high potential to cause business interruption, requiring significant effort to correct.	Suspended or severely reduced operations imposed by regulators. Breach of community commitment results in direct loss of established consents with widespread secondary effects.

Table 7-1 Detailed Environmental Risk Assessment

Environmental Aspect	Potential impact	Causes	Consequence	Risk Analysis C	Risk Analysis L	Risk Analysis Risk Rating	Existing Control Measures	Residual Risk C	Residual Risk L	Residual Risk Risk Rating	ALARP	Accepted
Water	Activities adversely affect surface water and groundwater	**(1a)** • Well integrity failure • Flow line and piping failures • Tank/Vessel failure	• Aquifer contamination (including methane) • Loss of aquifer pressure • Contamination of groundwater • Impacts groundwater dependent ecosystems	Serious	Possible	High	**Asset Integrity - Subsurface** • Well reads and inspection as required by the Well Integrity Management System (this includes but not limited to pressure and/or gas flow rates) • Chemical treatment (biocide, corrosion inhibitor, anti-scaling) of produced water reinjection bore • Asset protection (eg. Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use • Workover of wells if required (as described in the Reservoir Management Plan and the Well Monitoring Plan Palm Valley) • Monitoring of surrounding water bores and shut-in wellhead pressures for indications of gas migration • Routine well maintenance activities including integrity testing	Serious	Unlikely	Moderate	Central Petroleum consider aquifer contamination to be a serious consequence event and with it is current risk matrix this cannot be considered as a low risk even with a rare likelihood. Central Petroleum have assessed that there are no other reasonably practicable actions that can be taken and therefore consider the risk reduced to ALARP.	Y
		(1b) • Flow line and piping failures • Tank/Vessel failure	• Impacts to flora • Contamination of surface water body • Release of methane to atmosphere • Impacts groundwater dependent ecosystems	Serious	Possible	High	**Asset integrity – Surface facilities** • Management of change procedure for control of plant changes • Routine testing, inspection and preventative maintenance program (refer to maintenance management system) • Operate within safe operating envelope as protected by designed safety equipment and instrumentation • Asset protection (eg. Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
		(2) • Spill of chemical/hazard material via; ○ transport ○ Lack of appropriate bunding around storage and refuelling areas ○ Inappropriate storage of fuel, oil or chemical containers ○ Inappropriate handling of fuel, oil or chemicals during use	• Loss of containment of chemicals and hazardous materials • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	Serious	possible	High	**Chemical/hazardous material storage** • Register of hazardous materials maintained on site • All hazardous materials stored in appropriately bunded areas • Chemicals and hazardous goods stored in accordance with Dangerous Goods and Chemical Management procedure (MSTD09-PC019) • All chemicals and hazardous materials to be managed in accordance with Chemical/ Hazardous Materials Management Procedure (MSTD11-PC002) • Spill kits are available where hazardous materials are used and personnel trained in their correct use • Spill response measures shall be implemented for spills or leaks. • Emergency response plan is in place for responding to contaminant releases • Spill areas will be Identified and remediated in accordance with the National Environmental Protection Measure (NEPM) requirements • Use of drip trays when refuelling equipment • Plant and equipment inspected and maintained regularly to detect and prevent leakage of liquid contaminants (refer to maintenance management system) • Groundwater monitoring to detect any impacts to groundwater quality from CP activities	Minor	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
		(3) • Spill of brackish, saline or hypersaline produced water via; ○ transport, ○ flowline leak, ○ pond integrity failure, ○ pond over topping, and ○ unauthorised disposal	• Loss of containment of produced water • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	Major	Possible	Critical	**Produced water management** • Relevant staff trained and inducted into the storage, handling and transport of produced water. • Transport of waste under the requirements of the Waste Management and Pollution Control Act • Sufficient free board (200mm) maintained in evaporation pond to sustain a 1 in 100-year rainfall event • Recording and monitoring of the volume of leakage from PV-09 leak detection system • Bunding for tank storage of waste in a storage facility should be 120% of total volume of largest tank and located away from drainage lines. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • Contaminated material (e.g. contaminated soil) is appropriately contained and disposed using approved waste disposal company • Refer to "asset integrity – surface facilities control"	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y

Environmental Aspect	Potential impact	Causes	Consequence	Risk Analysis C	Risk Analysis L	Risk Rating	Existing Control Measures	Residual Risk C	Residual Risk L	Residual Risk Rating	ALARP	Accepted
		(4) • Inappropriate management of waste including; ○ Hazardous wastes and chemicals not removed at end of use ○ Waste receptacles not adequately secure ○ Wastes not removed frequently enough, overfill ○ Inappropriate disposal of wastes oil or chemicals ○ Waste not stored in bunded area if required ○ Unauthorised onsite disposal ○ Waste not separated and stored appropriately • Natural occurring radioactive material (NORM) concentrating in during operations	• Contaminated land, surface water, shallow groundwater • Encouragement of pest species to waste sites • Contamination ground and surface waters • Reduction in air quality • Impacts to flora or groundwater dependent ecosystems • Exposure of people and environment to increased level of radioactive source	Serious	Possible	High	**Waste management** • Bunding for storage of regulated wastes material contained in drums with capacity of at least 25% of the total volume of stored material • No waste or hazardous material stored with potential for over flow impact on water courses • All liquid storage to maintain adequate freeboard for an ARI of 1 in 100 years • All waste stored appropriately and fitted with secure, fauna proof lids • All hazardous waste material separated in the appropriate area for disposal according to their SDS and the hazardous goods register • All waste handling (e.g. transport, storage, treatment, recycling and disposal) is approved, conducted by an appropriately licenced contractor and/or facility where appropriate. Records of transport and disposal to be kept • All Listed Wastes as per the Waste Management and Pollution Control (Administration) Regulations to be handled by a Listed Waste Company as per the NT EPA website (https://ntepa.nt.gov.au/waste-pollution/approvals-licences/listed-waste) • For waste transported across state or territory borders, the National Environment Protection Measure (NEPM) 2013 Guidelines for Waste Transport will be adhered to • Sewage treated and solids disposed off-site by licensed contractor, with water released into rubble drains onsite • Regular inspection of waste containers to ensure no leaks. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • No incineration of waste • Relevant staff trained and inducted into the storage, handling and transport of hazardous wastes • Perform an initial test for NORM as soon as practicable after the restart of the PV facility • Based on the outcome of the initial test, develop an appropriate NORM management plan in line with the Safety Guidelines issued by APRANSA. • Train personnel on the hazards of NORM, risk of exposures and controls in place to monitor • Ensure of the correct PPE is provided when there is the potential for personal to be exposed to NORM	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
Land	Activities adversely affect landform and soils	**(5)** • Soil erosion from erosion sediment control failure ○ Flow concentration points not removed ○ Change in natural waterways and drainage channels	• Soil erosion and sedimentation • Flooding • Impacts to flora and fauna • Impacts to waterways from sedimentation • Loss of soil productivity	Minor	Unlikely	Low	**Erosion and sediment control** • Erosion and sediment control devices installed where necessary in conformance with the DENR (https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control) and International Erosion Control Association (IECA) guidelines • Current controls in place includes: ○ diversion banks ○ whoa boy's ○ no windrows or concentration points ○ drainage channel ○ regular inspections ○ berms to avoid sediment run off • For a proposed activity that has the potential for erosion and the movement of sediment, a specific erosion and sediment plan will be developed by a suitably qualified person. All controls within the site specific plan will be auditable. • After significant rainfall rehabilitated surfaces and disturbed areas inspected to confirm. ○ No erosion; ○ No sedimentation; ○ No blocking of drainage lines; and ○ An indication of vegetation growth. • Restore disturbed areas. Landform consistent with surrounding environment, no blocking of drainage channels or water courses • Landform consistent with surrounding environment, no blocking of drainage channels or water courses. • No driving off unformed tracks • Restricted third party access • No unauthorised clearing • All erosion gully heads removed and flattened to encourage laminar flow and reduce further development of erosion • Manage pooling water	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y

Environmental Aspect	Potential impact	Causes	Consequence	Risk Analysis C	Risk Analysis L	Risk Rating	Existing Control Measures	Residual Risk C	Residual Risk L	Residual Risk Rating	ALARP	Accepted
		(6) • Loss of soil productivity from rehabilitation failure ○ Poor top soil management • Loss of soil productivity due to soil compaction ○ Compacted soils not uncompacted to allow infiltration	• Loss or endangerment of threatened species • Loss of fauna and flora habitat • Rehabilitation failure, leads to future land degradation and flow on effects to the surrounding environment	Major	Possible	Critical	**Decommission and Rehabilitation Management** • Rehabilitation to be implemented 12 months post decommissioning of the infrastructure • When rehab is to occur topsoil will be spread and area re-seeded with local native seed. If germination does not occur after appropriate rainfall over several years re-seeding will be conducted. • Vegetation survey conducted before disturbance to provide baseline reference to determine post revegetation success • Location of top soil mounds clearly marked and less than 1.5m high to protect the biological activity of the top soil • All compacted hardstands and laydown areas deep ripped to encourage infiltration and water retention • Return all disturbed landforms to as close as possible the natural terrain • Photographic point monitoring established before disturbance and continued after to identify any areas requiring further rehabilitation work • Appropriate management and control of waste materials on and off-site • No new weeds or non-native plants introduced, and appropriate weed management implemented, as per CP "Biosecurity Management" under this FEMP	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
		(7) • Soil Contamination	• Localised soil contamination	Major	Possible	Critical	***Refer to mitigation measures in Groundwater for produced water spills, chemical/hazardous materials storage and waste management for the mitigation of contamination of soils.***	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
	Activities adversely affect Flora and Fauna	**(8)** • Introduction and spread of weeds, pathogens and invasive species via vehicles or equipment • Introduction and spread of weeds, pathogens and invasive species via contaminated fill • Increased occurrence of introduced and predator species ○ Standing water sites left unfenced ○ Food sources available	• Introduction or spread of weeds impacting native flora and fauna • Increased introduced species and predator species impacting on Flora and Fauna • Introduction of weeds impacts productivity of neighbouring properties	Major	Almost certain	Critical	**Biosecurity Management** *Flora* • Activities will adhere to the guidelines within the NT Weed Management Handbook and "Preventing weed spread is everybody's business" (https://denr.nt.gov.au/__data/assets/pdf_file/0011/257987/preventing-weed-spread.pdf) • Weed desktop and field-based surveys undertaken to identify existing weed areas • Vehicle and machinery to undergo weed free checks and compliance before mobilised to site • Vehicles and/or equipment coming from a weed invested area is required to be weed free and needs to provide a weed free certificate before entry • Major equipment moves will be planned from weed-free areas to infested areas and not the other way around • Inspections and periodic audits will be conducted to identify and report weed outbreaks • New activities will be planned to address prevention of weed or non-indigenous plant spread • Weeds will be monitored for and actively controlled in the entire OL area • Ensuring all material imported to or between sites is free of weeds • Baseline training for staff members responsible for preventing, identifying and managing weeds undertaken • Vegetation survey conducted before and after any disturbance or clearing operations to determine if new noxious species present • Photographic monitoring before and after any disturbance • No driving off unformed tracks. *Fauna* • Refer to "Waste Management" for waste storage • No feeding of fauna • All standing water fenced, where practicable • Standing water removed if no longer required • All food stored inside or in sealed containers • Personnel are prohibited from bringing domestic pets onto the gas field area	Minor	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y

Environmental Aspect	Potential impact	Causes	Consequence	Risk Analysis C	L	Risk Rating	Existing Control Measures	Residual Risk C	L	Risk Rating	ALARP	Accepted
		(9) • Fauna Strike from: ○ Unpredictable movement of animals ○ Vehicles travelling at high speeds ○ Vehicles travelling at dawn or dusk or in times of poor visibility	• Fauna death • Fauna injury	Minor	Likely	Moderate	• Refer to "Traffic and transport Management" • Track fauna strike/ near miss in the wild animal control register to enable knowledge sharing across CP personnel and contractors	Minor	Possible	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
		(10) • Civil maintenance impacts on flora and fauna from clearing vegetation and potential habitat. • Civils works required for rehabilitation • Civil Maintenance of roads, drains, hardstands, erosion and sediment controls	• Disturbance to environmentally sensitive areas and/or flora and fauna species • Disturbance of fauna • Loss or endangerment of threatened species • Loss of habitat • Impacts to the Slater Skink • Increased intensity of flooding can lead to vegetation degradation and habitat modification	Medium	Possible	Moderate	**Biodiversity Management** • Ecological assessment undertaken to identify environmentally sensitive areas (flora and fauna habitat) prior to disturbance • Civil maintenance activities avoid clearance of mature vegetation • Adhere to permit to work system, which ensures that all activities stay within the approved operational area • No unauthorised clearing. • Signage placed adjacent to known slater skink habitat north of PV2 • Establishment of sediment controls on northern edge of PV2 laydown (currently in place) • Induction of staff to include locations of slater skinks, sensitive habitat areas and characteristics. • Refer to "traffic and transport management" for driving control measures • Refer to "Erosion Sediment Controls" for flooding and run-off control measure	Medium	Rare	Low	Marking sensitive areas in the surrounding area prior to civil maintenance activities will reduce the potential consequence of civil maintenance activities on habitats, fauna and therefore reduce the risk to Low. This measure will be implemented as part of Palm Valley's Environmental Improvement Plan. The use of fauna spotter catcher will be reviewed on a case by case basis.	Y
		(11) • Bushfire associated with CP activities including; ○ Spill and ignition of flammable hazardous substance ○ Increased number of ignition sources ○ Increased fuel loads from civil maintenance	• Increased incident and intensity of bushfires leading to vegetation degradation and habitat modification • Native fauna fatality	Serious	Possible	High	**Bushfire Prevention** • Fire extinguishers fitted to all CP vehicles • No burning of waste • Only diesel vehicles used • Appropriate firefighting equipment available and serviced • Staff trained in the emergency response procedures and basic firefighting skills and communications with neighbours maintained • Firebreaks established and maintained around infrastructure (4 m fire break in accordance with NT requirements) • Availability of water to assist in fire control • Designated smoking areas with appropriate waste receptacles • Restricted vent access • No open flames or fires outside of designated areas • Ensure vegetation stockpiles are stored away from ignition sources and in low profile mounds	Medium	Rare	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
Air	Activities adversely affect air quality and climate	**(12)** • Operational activities • Operational upsets • Wear and tear of gas fittings • Vehicle movements on unsealed roads • Civil maintenance	• Release of atmospheric contaminants from exhausts • Release of greenhouse gases from gas pipe fittings and wellheads • Dust emissions	Minor	Possible	Low	**Air Quality Protection Measures** • Refer to "Asset integrity Surface facilities" control • Vehicles and equipment maintained and regularly serviced • Reduce speeds on unsealed roads • Monitor road conditions to ensure deterioration with possible increase in dust creation does not occur and undertake road rehabilitation as required • Dust control for civil maintenance • Watering of roads when appropriate • Monitoring of all venting events	Minor	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y

Environmental Aspect	Potential impact	Causes	Consequence	Risk Analysis C	Risk Analysis L	Risk Rating	Existing Control Measures	Residual Risk C	Residual Risk L	Residual Risk Rating	ALARP	Accepted
People and Communities	Activities adversely affect sensitive receptors	**(13)** • Increased traffic during plant turnarounds • Movement of heavy machinery on public roads • Disorganised storage and appearance of the PVGF • Areas no longer required not rehabilitated within PVGF • Release of waste without stakeholder engagement • Introduction of weeds from vehicles and equipment not properly inspected • Noise generated during routine operations, maintenance and civils work. • Artificial lighting required for safety during 24-hour operation • Bushfire from CPs activities • Increased intensity of flooding from CPs activities • Natural occurring radioactive material (NORM) concentrating in during operations	• Local community and landowners discontent • Increased potential for accidents and damage to infrastructure (eg arising from. Goods transportation and driver behaviours), • Increased occurrence of weed species • Loss of visual amenity impacting landholder, tourists or the wider community • Noise generation causing a nuisance • Light pollution impacting sensitive receptors • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands • Exposure of people and environment to increased level of radioactive source	Medium	Possible	Moderate	**Traffic and Transport Management** • Consult with surrounding stakeholders when major operation will occur • No unauthorised third-party access. • No driving under the influence of alcohol or drugs • Ensure vehicles are inspected regularly and have working lights and/or spot lights. • No off road driving • No speeding: Limit vehicle speeds to 60km/h on the access track, 40km/h between facilities and 10km/h around camp and facilities, except in the event of an emergency • Staff plan journeys in accordance to the CP Journey Management Plan • Limited driving at dawn and dusk • Refer to "Chemical and Hazardous materials Management" for transport **Community Impact Minimisation** • All activities to stay within the approved operating areas (per the Sacred Site Clearance Certificate (ref. C2015-035)) • Where possible, local and/or Indigenous people employed • Active stakeholder engagement and complaints management which includes consultation with surrounding stakeholders when operations likely impact on lighting, noise, vibration and visual amenity values (e.g. during shut down periods, major projects) • Refer to "Bushfire prevention" control • All personnel and site visitors complete the appropriate inductions *Visual* • Refer to "Waste Management" control for spills, waste storage and transport. • Refer to "Chemical and Hazardous Materials management" control for spills, handling and transport • Refer to "Decommissioning and rehabilitation management" control • Refer to "Erosion and Sediment Controls" control for disturbance • Refer to the "Biodiversity Management" control for weed impacts *Noise* • Refer to "Air Quality Protection Measures" for vehicle servicing *Lighting* • Minimal lighting used for safe operation of the plant and facilities **People** • Perform an initial test for NORM as soon as practicable after the restart of the PV facility • Based on the outcome of the initial test, develop an appropriate NORM management plan in line with the Safety Guidelines issued by APRANSA. • Train personnel on the hazards of NORM, risk of exposures and controls in place to monitor • Ensure of the correct PPE is provided when there is the potential for personal to be exposed to NORM	Medium	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y
	Activities adversely affect Indigenous heritage sites	**(14)** • Onsite indigenous heritage sites not previously determined during ethnographic study • Operational activities undertaken outside of the operating areas (per the Sacred Site Clearance Certificate (ref. C2015-035)). • Bushfire from CP activities • Increased intensity of flooding from CPs activities	• Disturbance to cultural heritage sites • Loss or destruction of cultural heritage sites	Serious	Possible	High	**Cultural Heritage and Sacred Sites Preservation** • Cultural Heritage Clearance (and identification of artefacts of Aboriginal significance in conjunction with the CLC and TOs) will be conducted prior to commencement of disturbance activities for civil maintenance • Adhere to permit to work system, which ensures that all activities stay within the approved operating areas • No unauthorised clearing • Restricted third-party access • Exclusion zones established • No off road driving • Refer to "Bushfire prevention" control	Minor	Unlikely	Low	Any potential future mitigation options will be reviewed as part of Central Petroleum's continual improvement activities in order to maintain risk reduction to ALARP.	Y

Note: (no.) is the hazard ID

7.7 Risk Summary

As a summary, Table 7-2 provides a count of the residual risks associated with the operations of the PVGF. This summary indicates that the controls are effective, have been successfully managed to ALARP and therefore the residual risk has been accepted by CP.

Further, to contextualise the hazards to CPs operations at PVGF Table 7-3 links the identified environmental hazards for the PVGF and relates each to the relevant sections of the conceptual site model, which is below for ease of reference. Table 7-4 links these hazards to broadly described activities that occur on the PVGF and are covered by this FEMP.

Table 7-2 Count of residual Risks for the Operations of PVGF

	Residual Risk			
	Low	Moderate	High	Critical
Count	13	1	0	0

Table 7-3 Key hazards and causes of potential impacts identified at specific areas within the PVGF

ID	Hazard/Causes	CSM	ID	Hazard/Causes	CSM
1 (a&b)	Asset integrity	A1-5	10	Impacts to flora and fauna from civil maintenance	A1-5
2	Spill of chemicals/hazardous materials	A2, A3	11	Bush fire from CP operations	A1-5
3	Spill of brackish/saline Produced Water	A5	12	Activities impacting air quality	A1-3
4	Inappropriate management of waste	A2-5	13	Community nuisance	A1-5
5	Soil erosion	A1-5		• Visual Amenity	A1-5
6	Rehabilitation failure	A1-5		• Increased traffic	A1-5
7	Soil contamination from spills	A1-A5		• Noise and Vibrations	A1-5
8	Introduced weeds, pathogens and invasive species	A1-A3		• Facility Lighting	A1-5
9	Fauna strike	A1-5	14	Impacts to indigenous heritage	A2,A3

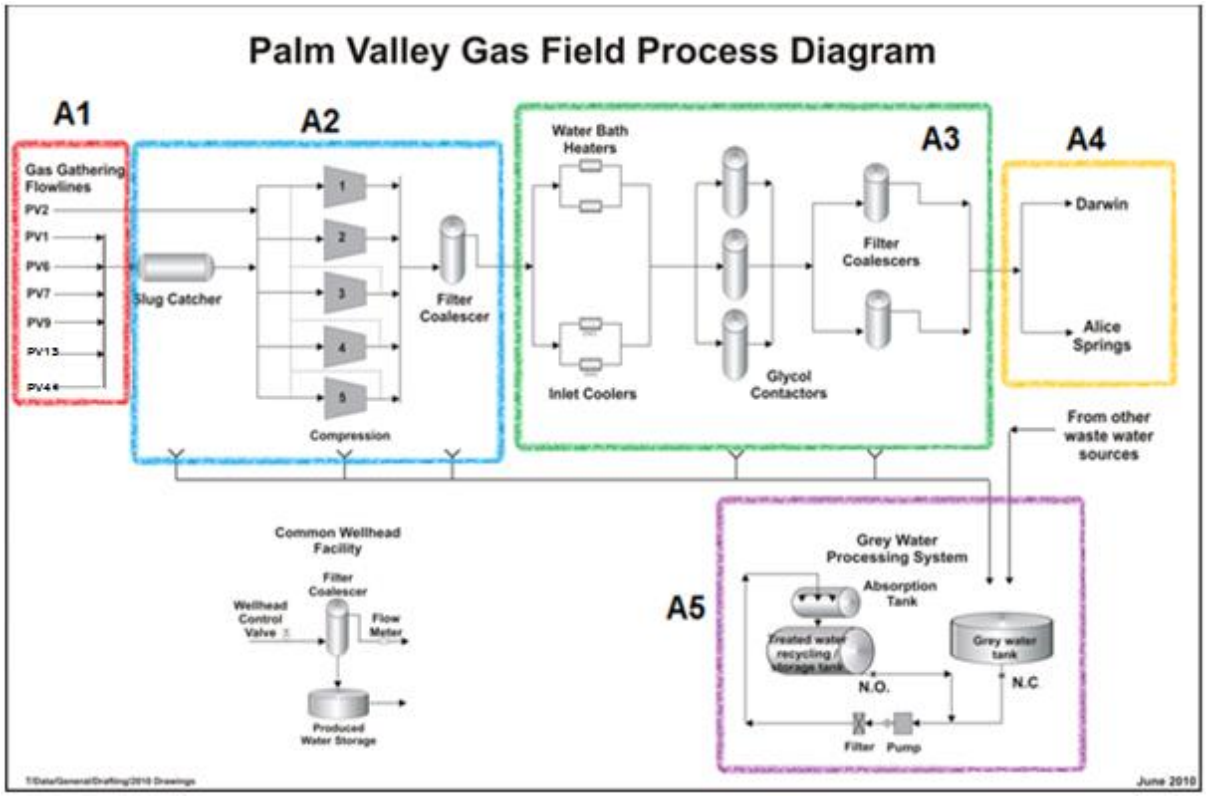
CSM – Conceptual Site Model

Table 7-4 Activities Carried out in the OL3 Area covered by this FEMP and Associated Hazards for Risk Assessment

Activity	Hazard/Causes
Civil construction works maintenance	5, 6,8, 10,11,12, 13 and 14
Storage, handling and transport of hazardous goods	2, 7 and 9
Hydrocarbon extraction, processing and transport	1 (a&b), 2, 3, 11 and 13
Waste disposal	2, 3, 4, 7, 8 and 13

General use of the OL3 area	8, 9, 11 and 13
Production water disposal	1 (a&b), 3, and 7
Unauthorised access	8, 9 13 and 14
Equipment and vehicle movements	8, 9 and 13
Rehabilitation and closure	5, 6 and 8

Conceptual Site Model from Section 6 Figure 6-4 is added to Section 7.7 for ease of reference to Tables 7-3 and 7-4



8 ENVIRONMENTAL MANAGEMENT

The approach taken in this FEMP is based on Ecologically Sustainable Development (EcSD) principles. It aims to provide measurable procedures and practises, to reduce the identified environmental risks to ALARP. This will ensure that the operation of the PVGF in the OL3 area will have as minimal negative environmental impact as possible, and at completion of operations, the environment within the OL3 area will be returned to a suitable landscape conductive to future rehabilitation success.

There will be regular stakeholder engagement and consultation throughout the operation of the OL3 area and implementation of the FEMP to prevent and mitigate the identified risks and any new risks. Feedback from affected stakeholders will be used to update and enhance the risk assessment and management process.

8.1 Ecological Sustainable Development

Ecological Sustainable Development (EcSD) is a concept based on implementing practices and principles that meet the needs of ecological process and people today without impeding on future generations to meet their needs. There is no universally accepted definition of EcSD however the Commonwealth Government of Australia suggests the following:

- ‘Using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased’ (Ecological Development Steering Committee, 1992).

The aim is to utilise natural resources to meet the current needs of CP without jeopardising the environment for future CP operations or other land managers. All aspects of environmental impacts have been assessed with appropriate preventative and mitigation measures implemented to ensure that all aspects of the OL3 area are developed in accordance with the EcSD concepts and this FEMP.

Forward planning and adaptation of EcSD concepts from inception of development will ensure that the environmental impacts of operations at the PVGF are minimised throughout the life span of CP’s and for land managers.

8.2 Environmental Outcomes, Performance Measures and Management Controls

The following section outlines the management controls that CP will employ during its activities to protect environmental values associated with:

- Asset Integrity
- Chemicals and Hazardous Materials
- Produced Water Management
- Waste Management
- Erosion and Sediment Controls
- Decommissioning and Rehabilitation Management
- Biosecurity Management
- Biodiversity Management
- Bushfire Prevention
- Air Quality Protection Measures
- Traffic and Transport Management
- Community Impact Minimisation
- Cultural Heritage and Sacred Sites Preservation

Successful implementation of the controls will be measured against the given performance measures. Record keeping requirements are also provided.

8.2.1 Asset Integrity

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified Section 7. Risks to the environment from asset integrity issues are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-1 in the OL3 area.

Table 8-1 Environmental Values and Objectives – Asset Integrity

Environmental Values	Protection of the ecosystem and human health values from uncontrolled discharges associate with asset integrity failures		
Management Objectives	Minimise impacts to ecosystem and human health values		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Operational activities • Maintenance activities	• Aquifer contamination • Loss of aquifer pressure • Contamination of groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems • Release of methane to atmosphere	**Asset Integrity - Subsurface** • Well reads and inspection as required by the Well Integrity Management System (this includes but not limited to pressure and/or gas flow rates) • Chemical treatment (biocide, corrosion inhibitor, anti-scaling) of produced water reinjection bore • Asset protection (Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use • Workover of wells if required (as described in the Reservoir Management Plan and the Well Monitoring Plan Palm Valley) • Monitoring of surrounding water bores and shut-in wellhead pressures for indications of gas migration **Asset integrity – surface facilities** • Management of change procedure for control of plant changes • Routine testing, inspection and preventative maintenance program (refer to maintenance management system) • Operate within safe operating envelope as protected by designed safety equipment and instrumentation • Asset protection (Fencing, bollards and traffic controls) • Emergency Response Plan in place and all staff trained and inducted in their use	
Performance Measures	• No asset integrity failures • No uncontrolled releases		
Records	• Management of change records • Asset installation records • Records of inspections, monitoring testing and maintenance • Training and induction records • Emergency response plans • Record of the leak detection volume • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum's incident reporting system		
Residual Risk	**Moderate**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.2 Chemicals and Hazardous Materials

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified Section 7. Risks to the environment from chemical and hazardous materials are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-2 in the OL3 area.

Table 8-2 Environmental Values and Objectives – Chemicals and Hazardous Materials

Environmental Values	• Protection of ecosystems and human health values from uncontrolled releases of chemicals and hazardous materials		
Management Objectives	• Minimise impacts to ecosystem and human health values		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operations activities • Storage of chemical/hazard material • Transport of chemical/hazard material	• Loss of containment of chemicals and hazardous materials • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	• Register of hazardous materials maintained on site • All hazardous materials stored in appropriately bunded areas • Chemicals and hazardous goods stored in accordance with Dangerous Goods and Chemical Management procedure (MSTD09-PC019) • All chemicals and hazardous materials to be managed in accordance with Chemical/ Hazardous Materials Management Procedure (MSTD11-PC002) • Spill kits are available where hazardous materials are used and personnel trained in their correct use • Spill response measures shall be implemented for spills or leaks. • Emergency response plan is in place for responding to contaminant releases • Spill areas will be Identified and remediated in accordance with the National Environmental Protection Measure (NEPM) requirements • Use of drip trays when refuelling equipment • Plant and equipment inspected and maintained regularly to detect and prevent leakage of liquid contaminants (refer to maintenance management system) • Groundwater monitoring to detect any impacts to groundwater quality from CP activities	
Performance Measures	• No uncontrolled releases of chemicals and hazardous materials • No incorrect storage and use of chemicals and hazardous materials		
Records	• Hazardous materials register to be maintained • Records of inspections, testing and maintenance to be maintained • Training and induction records to be maintained • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum's incident reporting system		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.3 Produced Water Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified Section 7. Risks to the environment from produced water are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-3 in the OL3 area.

Table 8-3 Environmental Values and Objectives – Produced Water Management

Environmental Values	• Protection of the ecosystem and human health values from uncontrolled discharges associated with produced water management		
Management Objectives	• Minimise impacts to ecosystem and human health values		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Produced water Operational activities • Maintenance activities • Transport of saline produced water • Storage of saline produced water • Disposal of saline produced water	• Loss of containment of produced water • Contamination of soil, shallow groundwater or surface water body • Impacts to flora or groundwater dependent ecosystems	• Relevant staff trained and inducted into the storage, handling and transport of produced water. • Recording and monitoring of the volume of leakage from PV-09 leak detection system • Transport of waste under the requirements of the Waste Management and Pollution Control Act • Sufficient free board (200mm) maintained in evaporation pond to sustain a 1 in 100-year rainfall event • Bunding for tank storage of waste in a storage facility should be 120% of total volume of largest tank and located away from drainage lines. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • Contaminated material (e.g. contaminated soil) is appropriately contained and disposed using approved waste disposal company • Monitoring of seepage volume from evaporation pond • Refer to "asset integrity – surface facilities" control	
Performance Measures	• No asset integrity failures • No uncontrolled releases of produced water		
Records	• Management of change records • Asset installation records • Records of inspections, monitoring testing and maintenance • Training and induction records • Emergency response plans • Records of releases, leaks and associated clean ups are to be managed using Central Petroleum's incident reporting system		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.4 Waste Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks to the environment from waste are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-4 in the OL3 area.

Table 8-4 Environmental Values and Objectives – Waste Management

Environmental Values	• Maintain the integrity of ecosystems and agricultural productivity • Minimise the amount of waste generated	
Management Objectives	• To minimise impacts on soil, surface water, groundwater, sensitive habitat and air quality • To minimise creation of food sources or habitat for pest species • To minimise waste generation through reduce, reuse, recycle programs	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Civil maintenance • Operational activities • Produced water and oily water disposal • Camp and office operations • Domestic waste production • Waste production from the treatment process • Natural occurring radioactive material (NORM) concentrating in during operations	• Contaminated land, surface water, shallow groundwater • Encouragement of pest species to waste sites • Contamination ground and surface waters • Reduction in air quality • Higher levels of NORM's contaminating soils and groundwater and exposure to people	• Bunding for storage of regulated wastes material contained in drums with capacity of at least 25% of the total volume of stored material • No waste or hazardous material stored with potential for over flow impact on water courses • All liquid storage to maintain adequate freeboard for an ARI of 1 in 100 years • All waste stored appropriately and fitted with secure, fauna proof lids • All hazardous waste material separated in the appropriate area for disposal according to their SDS and the hazardous goods register • All waste handling (e.g. transport, storage, treatment, recycling and disposal) is approved, conducted by an appropriately licenced contractor and/or facility where appropriate. Records of transport and disposal to be kept • All Listed Wastes as per the Waste Management and Pollution Control (Administration) Regulations to be handled by a Listed Waste Company as per the NT EPA website (https://ntepa.nt.gov.au/waste-pollution/approvals-licences/listed-waste) • For waste transported across state or territory borders, the National Environment Protection Measure (NEPM) 2013 Guidelines for Waste Transport will be adhered to • Sewage treated and solids disposed off-site by licensed contractor, with water released into rubble drains onsite • Regular inspection of waste containers to ensure no leaks. • Assess all spills and/or leaks for appropriate remediation action in conformance to NEPM 2013 guidelines. • No incineration of waste • Relevant staff trained and inducted into the storage, handling and transport of hazardous wastes • Perform an initial test for NORM as soon as practicable after the restart of the PV facility • Based on the outcome of the initial test, develop an appropriate NORM management plan in line with the Safety Guidelines issued by APRANSA. • Train personnel on the hazards of NORM, risk of exposures and controls in place to monitor • Ensure of the correct PPE is provided when there is the potential for personal to be exposed to NORM

Performance Measures	• The outcomes of waste management practices can be assessed against the performance criteria for: • Absence of domestic waste remaining onsite at completion of activities (i.e. general rubbish, waste chemicals, workshop wastes including oily rags, containers etc.). • No unregulated waste handling. • Pest species not encouraged to the site. • All waste certificates to be noted and accounted for • NORM exposure understood and management plan in place		
Records	• Waste registers to be maintained • Waste disposal records to be maintained (all waste certificates to be noted and accounted for) • Records of waste storage site inspections to be maintained • Incidents of uncontrolled waste releases will be reported in CP's incident reporting system and corrective action initiated. Reportable incident records and regulatory notifications will be maintained. • Regulatory reporting under the NPI • NORM testing records		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.5 Erosion and Sediment Control

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks from erosion and sedimentation in the OL3 area are managed to ALARP in order to meet the CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-5 in the OL3 area.

Table 8-5 Environmental Values and Objectives – Erosion and Sediment Control

Environmental Values	• Suitability and stability of land for existing uses (Erosion and Sediment Controls implemented) • Stability of land to preserve existing water quality, landscapes and ecosystems	
Performance Objectives/Outcomes	• Minimise disturbance to land and land use (including soils and terrain, flora and fauna) • Minimise erosion (via water or wind) and sediment releases • Protection of waterways. • Return disturbed areas to a stable landform such that they are returned to a condition as close as practicable to the surrounding area (or pre-disturbance state) within an acceptable time frame. • Protect the productivity of the land for its intended land use	
Activity	**Potential Impacts without Management Controls**	**Management Controls**

• Civil maintenance
• Operational activities
• Rehabilitation activities
	• Soil erosion and sedimentation
	• Loss of soil productivity
	• Flooding
	• Rehabilitation failure
	• Change in natural waterways and drainage channels
		• Erosion and sediment control devices installed where necessary in conformance with the DENR (https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control) and International Erosion Control Association (IECA) guidelines
		• Current controls in place includes:
		  ○ diversion banks
		  ○ whoa boy's
		  ○ no windrows or concentration points
		  ○ drainage channel
		  ○ regular inspections
		  ○ berms to avoid sedimentation run-off
		• Proposed activity that has the potential for erosion and the movement of sediment, a specific erosion and sediment plan will be developed by a suitably qualified person. All controls within the site specific plan will be auditable.
		• After significant rainfall rehabilitated surfaces and disturbed areas inspected to confirm.
		  ○ No erosion;
		  ○ No sedimentation;
		  ○ No blocking of drainage lines; and
		  ○ An indication of vegetation growth.
		• Restore disturbed areas
		• Landform consistent with surrounding environment, no blocking of drainage channels or water courses
		• No driving off unformed tracks
		• Restricted third party access
		• No unauthorised clearing

		• All erosion gully heads removed and flattened to encourage laminar flow and reduce further development of erosion • Manage pooling water
Performance Measures	• Land disturbance equal to or less than planned • Minimum incidences of erosion and sedimentation occurring • Areas left safe, stable and non-polluting • Commence to rehabilitate disturbed areas within 12 months of decommission • No new erosion flow paths originated from site • No flow on effects caused by flooding at CP's operational sites	

Monitoring and Records	• The extent of disturbances will be measured and uploaded to a Geographic Information System (GIS).
	• Monitoring for soil erosion and related issues is best undertaken at critical stages, such as:
	  ○ After completion of a specific phase of activity all areas disturbed should be inspected for early signs of compaction, erosion and soil degradation (generation of bulldust)
	  ○ When accessing the site after the wet season look for signs of erosion. If significant impacts are identified remediation works may need to be conducted prior to continued vehicular access.
	  ○ After more than 20 mm of rainfall
	• Where rehabilitation of a site is undertaken, rehabilitation will be monitored until the site is reinstated	

Residual Risk	**Low**	**Risk Control Effectiveness** / **Effective**
Risk Accepted	**Yes**	

8.2.6 Decommissioning and Rehabilitation Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks to environmental values from decommissioning and rehabilitation practices are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-6 in the OL3 area.

Table 8-6 Environmental Values and Objectives – Decommissioning and Rehabilitation Management

Environmental Values	• Maintain the integrity of significant ecosystems and agriculture productivity • Maintain habitat elements for native flora and fauna, including species protected by EPBC Act and TPWC Act			
Management Objectives	• A safe, stable landform consistent with surrounding land use • Rehabilitation of disturbed areas is returned to the original land use and is consistent with the adjacent analogue site			
Activity	**Potential Impacts without Management Controls**	**Management Controls**		
• Decommissioning and rehabilitation activities	• Rehabilitation failure • Loss or endangerment of threatened species • Loss of fauna and flora habitat • Loss of re-established habitat • Rehabilitation failure, leads to future land degradation and flow on effects to the surrounding environment • Loss of soil productivity	• Rehabilitation to be implemented 12 months post decommissioning of the infrastructure • When rehab is to occur topsoil will be spread and area re-seeded with local native seed. If germination does not occur after appropriate rainfall over several years re-seeding will be conducted. • Vegetation survey conducted before disturbance to provide baseline reference to determine post revegetation success • Location of top soil mounds clearly marked and less than 1.5m high to protect the biological activity of the top soil • All compacted hardstands and laydown areas deep ripped to encourage infiltration and water retention • Return all disturbed landforms to as close as possible the natural terrain • Photographic point monitoring established before disturbance and continued after to identify any areas requiring further rehabilitation work • Appropriate management and control of waste materials on and off-site • No new weeds or non-native plants introduced, and appropriate weed management implemented, as per CP "Biosecurity Management" under this FEMP		
Performance Measures	• Successful rehabilitation to a similar condition of surrounding environment • No further habitat loss resulting from CP's activities • Continual decommissioning of redundant assets			
Records	• Records of rehabilitation monitoring • Inventory of decommissioned infrastructure • All incidents will be reported in Central Petroleum's incident reporting system and corrective action initiated.			
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**	
Risk Accepted	**Yes**			

8.2.7 Biosecurity Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks to biosecurity are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-7 in the OL3 area.

Table 8-7 Environmental Values and Objectives – Biosecurity Management

Environmental Values	• Maintain the integrity of significant ecosystems and agricultural productivity	
Management Objectives	• Avoid the introduction of weeds and pest fauna • Avoid the spread of existing weeds and pest fauna	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Vehicle movements • Civil maintenance • Operations and maintenance activities • Office and camp operations • Transport of fill materials • Water and food sources available	• Introduction or spread of weeds impacting native flora and fauna • Increased introduced species and predator species impacting on Flora and Fauna • Introduction of weeds impacts productivity of neighbouring properties	*Flora* • Activities will adhere to the guidelines within the NT Weed Management Handbook and "Preventing weed spread is everybody's business" (https://denr.nt.gov.au/__data/assets/pdf_file/0011/257987/preventing-weed-spread.pdf) • Weed desktop and field-based surveys undertaken to identify existing weed areas • Vehicle and machinery to undergo weed free checks and compliance before mobilised to site • Vehicles and/or equipment coming from a weed invested area is required to be weed free and needs to provide a weed free certificate before entry • Major equipment moves will be planned from weed-free areas to infested areas and not the other way around • Inspections and periodic audits will be conducted to identify and report weed outbreaks • New activities will be planned to address prevention of weed or non-indigenous plant spread • Weeds will be monitored for and actively controlled in the entire OL area • Ensuring all material imported to or between sites is free of weeds • Baseline training for staff members responsible for preventing, identifying and managing weeds undertaken • Vegetation survey conducted before and after any disturbance or clearing operations to determine if new noxious species present • Photographic monitoring before and after any disturbance • No driving off unformed tracks. *Fauna* • Refer to Management Controls for "Waste Management "for waste storage • No feeding of fauna • All standing water fenced, where practicable • Standing water removed if no longer required • All food stored inside or in sealed containers • Personnel are prohibited from bringing domestic pets onto the gas field area

Performance Measures	• No introduction or spread of declared weeds and/or pest fauna resulting from Central Petroleum's activities		
Records	• Records of weed distribution will be maintained within Central Petroleum's GIS and if required provided to the Weeds Officer at DENR & DPIR • Records of weed inspections will be maintained • All weed outbreak and pest fauna incidents will be reported in Central Petroleum's incident reporting system and corrective action initiated • It is noted that under the Weeds Management Act that: *'The owner and occupier of land must… within 14 after becoming aware of a declared weed that has not previously been, or known to have been, present on the land, notify and officer of the presence of the declared weed'*		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.8 Biodiversity Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks to flora and fauna are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-8 in the OL3 area.

Table 8-8 Environmental Values and Objectives – Biodiversity Management

Environmental Values	• Maintain the integrity of significant ecosystems and agriculture productivity • Maintain habitat elements for native flora and fauna, including species protected by EPBC Act and TPWC Act • Avoid clearing high value habitat		
Management Objectives	• Minimise disturbance to flora and fauna • Minimise disturbance to sensitive areas		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance of roads, drains, hardstands, erosion and sediment controls • Clearing of vegetation and potential habitat • Civil works required for rehabilitation	• Disturbance to environmentally sensitive areas and/or flora and fauna species • Disturbance of fauna • Loss or endangerment of threatened species • Loss of habitat • Impacts to the Slater Skink • Increased intensity of flooding can lead to vegetation degradation and habitat modification	• Ecological assessment to be undertaken to identify environmentally sensitive areas (flora and fauna habitat) prior to disturbance • Civil maintenance activities avoid clearance of mature vegetation • Adhere to permit to work system, which ensures that all activities stay within the approved operational area • No unauthorised clearing. • Signage placed adjacent to known slater skink habitat north of PV2 • Establishment of sediment controls on northern edge of PV2 laydown (currently in place) • Induction of staff to include locations of slater skinks, sensitive habitat areas and characteristics. • Ongoing monitoring of known population during annual audit • Refer to "Traffic and Transport Management" for driving control measures • Refer to "Erosion Sediment Controls" for flooding and run-off control measures	
Performance Measures	• Monitoring OL3 area to minimise impacts to fauna habitat and sensitive vegetation. • No native fauna impacts (injury or fatality). • No loss of sensitive vegetation resulting from CP's activities.		
Records	• Records of disturbance will be maintained. • Records of inspections will be maintained. • All incidents will be reported in CP's incident reporting system and corrective action initiated.		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.9 Bushfire Prevention

The following table outlines mitigation measures and their implementation to reduce the risks, identified in Section 7. Risks from fire on environmental aspects in the OL3 area are managed to ALARP in order to meet the CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-9.

Table 8-9 Environmental Values and Objectives – Bushfire Prevention

Environmental Values	• Maintain a natural fire regime of the region • Protection of public, private infrastructure and equipment		
Management Objectives	• Minimise the risk of causing bushfires from Central Petroleum's activities • To minimise impacts on environmental habitat and fauna, soil erosion, impacts on stakeholders, impacts on culturally significant sites, public infrastructure and community lands • To prevent accidental fire risk and ensure safe storage of chemicals		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operational activities • Venting • Vehicle and equipment movement • smoking	• Increased incident and intensity of bushfires can lead to vegetation degradation and habitat modification • Native fauna fatality • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands • Damage to or loss of culturally significant sites	• Fire extinguishers to be fitted to all vehicles • No burning of waste • Only diesel vehicles to be used • Appropriate firefighting equipment available and serviced • Staff trained in the emergency response procedures and basic firefighting skills and communications with neighbours maintained. • Firebreaks established and maintained around infrastructure (4 m fire break in accordance with NT requirements) • Availability of water to assist in fire control • Designated smoking areas with appropriate waste receptacles • Restricted vent access • No open flames or fires outside of designated areas • Ensure vegetation stockpiles are stored away from ignition sources and in low profile mounds	
Performance Measures	• Successful fire management will be indicated by having no uncontrolled fires occurring as a result Central Petroleum's activities.		
Records	• All incidents of fire to be recorded in CP's incident reporting system and corrective action initiated.		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.10 Air Quality Protection Measures

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks to air quality are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-10 in the OL3 area.

Table 8-10 Environmental Values and Objectives – Air Quality Protection Measures

Environmental Values	• Rural air environment with qualities conducive to suitability for the life, health and wellbeing of humans and ecosystems		
Management Objectives	• Minimise environmental nuisance due to dust for sensitive receptors resulting from Central Petroleum's activities • Minimise greenhouse gas emissions		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Operational activities • Operational upsets • Wear and tear of gas fittings • Vehicle movements on unsealed roads • Civil maintenance	• Release of atmospheric contaminants from exhausts • Release of greenhouse gases from gas pipe fittings and wellheads • Dust emissions	• Refer to "Asset Integrity" management controls • Vehicles and equipment maintained and regularly serviced • Reduce speeds on unsealed roads • Monitor road conditions to ensure deterioration with possible increase in dust creation does not occur and undertake road rehabilitation as required • Dust control for civil maintenance • Watering of roads when appropriate and agreed with landholders • Monitoring of all venting events	
Performance Measures	• No complaints regarding dust/air quality • Amicable resolution of complaints.		
Records	• Annual NGERS and NPI reporting will be completed • Records of routine inspections for leaks will be maintained • All complaints and subsequent actions are to be recorded in Central Petroleum's incident reporting system and corrective action initiated		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.11 Traffic and Transport Management

The following table outlines mitigation and preventative measures and their implementation to reduce the risks as identified in Section 7. Risks from traffic and transport are managed to ALARP in order to meet CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-11in the OL3 area.

Table 8-11 Environmental Values and Objectives – Traffic and Transport Management

Environmental Values	• Livelihood and well-being of local communities and towns	
Management Objectives	• Minimise impacts upon environmental values of the local community • Minimise impacts on cultural heritage • Minimise safety risks to the public and other third parties • Maintain and enhance partnerships with the local community, including using local contractors • No loss to the aesthetic or enjoyment factor for the community	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Civil maintenance • Operational and maintenance activities • Increased traffic during plant turnarounds • Movement of heavy machinery on public roads	• Local community and landowners discontent • Increased potential for accidents and damage to infrastructure (eg arising from. Goods transportation and driver behaviours), • Increased occurrence of weed species • Loss of visual amenity impacting landholder, tourists or the wider community • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands • Fauna strikes / fauna fatality • Environmental harm from traffic erosion or incident	• Consult with surrounding stakeholders when major operation will occur • No unauthorised third-party access. • No driving under the influence of alcohol or drugs • Ensure vehicles are inspected regularly and have working lights and/or spot lights. • No off road driving • No speeding: Limit vehicle speeds to 60km/h on the access track, 40km/h between facilities and 10km/h around camp and facilities, except in the event of an emergency • Staff plan journeys in accordance to the CP Journey Management Plan • Limited driving at dawn and dusk • Refer to "Chemical and Hazardous materials Management" for transport

Performance Measures	• An absence of issues raised by the community as indicator for successful communication • No unresolved complaints • The community is highly consulted with and all comments provided are assessed and those viable implemented • High level of satisfaction by the community • No vehicular accidents		
Records	• Register kept of all incidences relating to access issues, unauthorised access and requirements of pastoralists, recognising that these requirements may change seasonally • Track fauna strike/ near miss in the wild animal control register to enable knowledge sharing across CP personnel • Complaints register • Record of stakeholder engagement • Record of environment compliance • All traffic and transport incidents related to any contamination to the environment, erosion or loss of fauna to be recorded in CP's incident reporting system • Corrective actions to be closed out and recorded		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.12 Community Impact Minimisation

The following table outlines mitigation measures and their implementation to reduce the risks as identified in Section 7. Risks to community in the OL3 area are mimimised to ALARP in order to meet the CP's objective and successfully deliver the detailed environmental outcomes as shown in Table 8-12.

Table 8-12 Environmental Values and Objectives – Community Impact Minimisation

Environmental Values	• Livelihood and well-being of local communities and towns	
Management Objectives	• Minimise impacts upon environmental values of the local community • Minimise impacts on cultural heritage • Minimise safety risks to the public and other third parties • Maintain and enhance partnerships with the local community, including using local contractors • No loss to the aesthetic or enjoyment factor for the community	
Activity	**Potential Impacts without Management Controls**	**Management Controls**
• Civil maintenance • Operational and maintenance activities • Shut downs, projects and workovers • Office and camp operations • Release of waste • Noise generated during routine operations, maintenance and civils work. • Artificial lighting required for safety during 24-hour operation	• Local community and landowners discontent • Loss of visual amenity impacting landholder, tourists or the wider community • Noise generation causing a nuisance • Light pollution impacting sensitive receptors • Damage to or loss of public infrastructure, private infrastructure and equipment or community lands	• All activities to stay within the approved operating areas (per the Sacred Site Clearance Certificate (ref. C2015-035)). • Where possible, employ local and/or Indigenous people. • Active stakeholder engagement and complaints management which includes consultation with surrounding stakeholders when operations likely impact on lighting, noise, vibration and visual amenity values (e.g. during shut down periods, major projects) • Refer to "Bushfire Prevention • Ensure that all CP's environmental standards, plans and procedure are met to not cause any impact to the community • All personnel and site visitors will complete the appropriate inductions ***Visual*** • Refer to "Waste Management" for spills, waste storage and transport. • Refer to "Chemical and Hazardous Materials Management" for spills, handling and transport • Refer to "Decommissioning and Rehabilitation Management" • Refer to "Erosion and Sediment Controls" for disturbance • Refer to Biosecurity Management" for weed and pest fauna management ***Noise*** • Refer to "Air Quality" for vehicle servicing ***Lighting*** • Minimal lighting used for safe operation of the plant and facilities

Performance Measures	• An absence of issues raised by the community as indicator for successful communication • No unresolved complaints • The community is highly consulted with and all comments provided are assessed and those viable implemented • High level of satisfaction by the community • No vehicular accidents • No off site release of contamination from road corridors		
Records	• Register kept of all incidences relating to access issues, unauthorised access and requirements of pastoralists, recognising that these requirements may change seasonally • Land access agreements closed out at completion. • Complaints register • Record of stakeholder engagement • Record of environment compliance • All traffic and transport incidents related to any contamination to the environment, erosion or loss of fauna to be recorded in CP's incident reporting system. Corrective actions to be closed out and recorded		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

8.2.13 Cultural Heritage and Sacred Sites Preservation

The following table outlines mitigation measures and their implementation to reduce the risks as identified in Section 7. Risks to heritage and cultural aspects in the OL3 area are managed to ALARP in order to meet the CP's management objective and successfully deliver the detailed environmental outcomes as shown in Table 8-13.

Table 8-13 Environmental Values and Objectives – Cultural Heritage and Sacred Sites Preservation

Environmental Values	• Maintain cultural heritage values of the region, both Indigenous and non-Indigenous		
Management Objectives	• To avoid disturbance of or damage to Aboriginal or cultural heritage artefacts or Sacred Sites • To minimise impacts upon or disruption to activities of Indigenous stakeholders in culturally significant areas • To ensure adequate background information and training is provided to employees and contractors working in culturally significant areas • To ensure that the health and safety of workers and the community is not compromised through management of cultural and environmental awareness		
Activity	**Potential Impacts without Management Controls**	**Management Controls**	
• Civil maintenance • Operations activities • Maintenance activities • Vehicle and equipment movement	• Disturbance to cultural heritage sites • Loss or destruction of cultural heritage sites	• Cultural Heritage Clearance (and identification of artefacts of Aboriginal significance in conjunction with the CLC and TOs) will be conducted prior to commencement of disturbance activities for civil maintenance • Adhere to permit to work system, which ensures that all activities stay within the approved operating areas • No unauthorised clearing • No unauthorised third-party access • Exclusion zones • No off road driving • Refer to "Bushfire Prevention"	
Performance Measures	• No incidences of disturbance of archaeological sites or sites of cultural significance		
Records	• A register is kept of all occurrences of archaeological sites identified for provision to the NLC, the AAPA and Heritage Branch within DLPE • Ensure that site personnel and contractors report all new discoveries of archaeological or cultural artefacts. Cease work and effect practical protection measures until the area can be assessed by appropriate personnel		
Residual Risk	**Low**	**Risk Control Effectiveness**	**Effective**
Risk Accepted	**Yes**		

9 IMPLEMENTATION STRATEGY

9.1 Health, Safety and Environment Integrated Management System, Practises and Procedures

Management of PVGF operations is undertaken within the framework of the CP Health Safety and Environment Management System (CP HS&E MS) and includes the specific implementation strategies and procedures described within Section 8.3. The key elements of the CP HS&E MS include:

- Matching of legal obligations to the practical needs of all operations;
- Assignment of responsibilities required to meet the commitments set out in the CP HS&E MS Policy;
- A common measurement/audits process to check that standards are complied with;
- Encouragement of improvement in process and performance through feedback processes;
- Appropriate and comprehensive documentary support; and
- Application of the system to all levels and areas of the organisation (including work by contractors), and to all working conditions and any activities that may have the potential to affect the health and safety of people or harm the environment.

The system has been constructed in a hierarchical manner, with the following tiers or levels of documents:

- Standards;
- Policies;
- Procedures;
- Work instructions;
- Registers; and
- Other records and supporting documentation.

In order to provide for a comprehensive HS&E MS, the following procedure Standards have been developed:

Standard 1: Environment, Health and Safety Policies
Standard 2: Legal and Other Obligations
Standard 3: Objectives and Targets
Standard 4: Improvement Plans
Standard 5: Responsibility and Accountability
Standard 6: Training and Competency
Standard 7: Consultation and Communication
Standard 8: Document and Record Management
Standard 9: Hazard Identification, Risk Assessment and Control
Standard 10: Contractor and Supplier Management
Standard 11: Operations Integrity
Standard 12: Management of Change
Standard 13: Emergency Preparedness
Standard 14: Monitoring, Measurement and Reporting
Standard 15: Incident Investigation
Standard 16: Management System Audit and Assessment
Standard 17: Management Review

9.2 Roles and Responsibilities

It is the responsibility of CP employees and contractors to comply with the company's Environmental protection Policy provided in Figure 3-1 and CP's corporate HS&E Policy in Figure 3-2.

It is everybody's responsibility to ensure the OL3 area's environmental standards are maintained. The Supervisor at the PVGF is responsible for maintaining and implementing this FEMP. The General Manager of Operations is responsible for submitting new revisions of this document to the DPIR.

9.2.1 Organisational Structure

Figure 9-1 details the organisational structure currently in operation at CP. The Site Supervisor and Operator Maintainers work on site on a 2 weeks on and 2 weeks off roster.

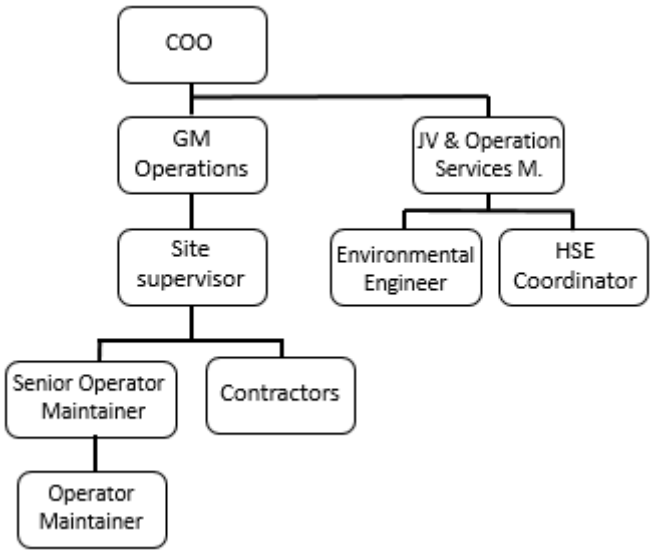


Figure 9-1 Organisational chart with current roles and responsibilities

9.2.2 CP General Manager of Operations

It is the responsibility of the General Manager of Operations to:

- Ensure that the requirements of the FEMP are implemented and updated accordingly;
- Ensure conformance with the CP HS&E MS;
- Ensure required permits and approvals are in place and complied with;
- Internal and external audits are carried out;
- Ensure that all environmental incidents are reported to the CP management team and (where required) to the regulator;
- Ensure contractors HS&E systems are compliant with CP's HS&E MS and this FEMP; and
- Ensure that appropriate communications are in place between CP, the land owner and other stakeholders to keep them informed of project issues and developments that may affect their activities.

9.2.3 CP PVGF Site Supervisor

It is the responsibility of the Site Supervisor to:

- Ensure that all aspects of the FEMP for which he/she is responsible for are conducted;
- Ensure a site/project specific induction, including a *Site Orientation Checklist,* is conducted prior to any contractor commencing work on site, and
- Ensure a *Visitor Induction* is conducted prior to allowing any casual persons (anyone who does not have work to perform on site) to enter the site.
- Ensure all hazards, incidents and near misses are promptly reported, investigated and appropriate corrective action completed;
- Maintain operating practices which meet CP HS&E MS standards;

9.2.4 CP HS&E Coordinators / Environmental Engineer

It is the responsibility of the HS&E Coordinators / Environmental Engineer to:

- Work with the CP General Manager of Operations and PVGF Supervisor to develop and implement procedures, work instructions, registers, forms and other documents to ensure on-ground works comply with the requirements of this FEMP;
- Work with the CP General Manager of Operations and PVGF Supervisor to ensure contractors HS&E management systems comply with CP's HS&E MS or a bridging document in place and enforced;
- Ensure that all new employees receive relevant corporate induction and training;
- Provide ongoing training at site/s to ensure all personnel and contractors have the skills and knowledge to carry out assigned tasks in a safe and productive manner;
- Ensure all employees and visitors comply with CP HS&E MS policies and procedures;
- Ensure compliance with all relevant legislative requirements;
- Identify potential hazards through regular workplace inspections and implement corrective action when required;
- Encourage employee participation in training programs and initiatives.

9.2.5 Operator Maintainer / Contractors / Personnel / Visitors

It is the responsibility of the Operators/Contractors/Personnel/Visitors to:

- Follow CP's procedures and work instructions;
- Complete CP's registers and forms as required;
- Encourage improvement wherever possible;
- Promptly report all HS&E hazards, incidents and near misses to their immediate supervisor;
- Comply with CP HS&E MS policies and procedures;
- Ensure that work is not undertaken for which they feel they have not received adequate information and/or instruction;

- Never undertake any task that does not meet CP HS&E MS standards; and,
- Actively participate in CP HS&E MS and training initiatives.

9.3 Training and Competencies

CP will take all steps to ensure ongoing training and awareness is conducted with all personnel and contractors. This will enable CP, its workforce and contractors to cooperate effectively in developing and promoting measures to ensure a high level of HS&E knowledge and compliance.

CP's HS&E MS training and awareness include:

- Compulsory site inductions;
- Pre-start (Toolbox) meetings;
- Routine HS&E meetings and reports;
- Shift handovers; and
- Dissemination and display of HS&E related information.

Additional training will be provided on an as required basis.

9.3.1 Site Inductions

Site inductions are compulsory and are the key mechanism CP employs to ensure all personnel, contractors and visitors are informed of CP HS&E MS and this FEMP including legislative responsibilities.

As a minimum, CP will ensure all personnel and contractors are trained in and are aware of the following CP systems:

- Permit to Work system;
- Isolation and tagging procedures;
- Job Hazard Analysis (JHA);
- Remote communication equipment and procedures;
- Field Operations Emergency Response Plan;
- Spill prevention;
- Land disturbance;
- Waste Management;
- Pest, plant and animal control;
- Incident reporting;
- Environmental Awareness; and
- Speed limits
- This FEMP
    - Once approved the FEMP will be rolled out across the business,
    - Site inductions includes the employee and contractors responsibilities under the FEMP, and
    - A copy of the FEMP is available on site to all employees and contractors.

Visitors will receive a limited site induction that covers emergency response and this FEMP. All visitors must be signed in by and be accompanied by a CP representative at all times whilst on site unless a full site induction is provided.

A register of inducted CP personnel and contractors will be maintained for auditing purposes.

9.3.2 HS&E Meetings

As minimum, HS&E meetings will be held six monthly with all personnel, including all contractors and visitors that are on site. HS&E meeting minutes will:

- Include a cover sheet including the names of all personnel in attendance;

- Be recorded in detail on the HS&E Meeting Minutes form ensuring all items discussed are recorded and tracked for close-out as appropriate;
    - Topics on environment include:
        - Environmental performance (spills and incidents),
        - Outcome of environmental incident investigations,
        - Outcome of Environment inspections, and
        - Outcomes and corrective actions from the Annual FEMP Audit
- Itemise the main issues discussed at the meeting and agree on action items; and
- Assign a nominee to close out any action item.

All action items are to be transferred to the site Register and Closeout of Correcting Actions (RCCA) for tracking and close out.

HS&E meeting minutes and the updated RCCA will be displayed on the site HS&E notice boards.

9.3.3 HS&E Reports

CP PVGF Supervisor will provide regular updates to CP Management including the CP General Manager of Operations and CP HS&E Coordinator. The update will include:

- HS&E meeting minutes;
- Site HS&E statistics (including internal environmental performance metrics - recordable incidents, water produced, water consumed and emissions released);
- RCCA; and
- Results of emergency simulation training exercises.

9.3.4 Pre-start (Toolbox) Meetings

A toolbox meeting will be held daily and prior to any change in activity commencing on the day of an activity occurring. These are designed for employees to discuss task HS&E issues and specific requirements for the day's operations, including work permits.

The meeting is designed to discuss the following issues on a daily basis:

- Operations to be conducted during the next 12 hours and any potentially hazardous activities associated to those activities and a review of the controls under the FEMP for the operational activities;
- Any hazards identified in the last 24 hours that may affect the work force or operations; and
- Any incidents or accidents that have occurred in the last 12 hours.

9.3.5 Shift Handovers

CP have developed and implemented a suitable handover procedure for shift changes and crew changes to ensure that relieving personnel are fully aware of their responsibilities and work status. Shift change handovers include the completion of checklists and other specified documentation. The handover checklist includes as a minimum:

- Any equipment damaged or out of service;
- Status of current operations (inclusive of matters pertaining to the FEMP);
- Any personnel or crew issues that the relief needs to be aware of; and
- Third party equipment or operation in the area.

9.3.6 HS&E Related Information

CP makes relevant HS&E information available by displaying on the site HS&E notice board. This may include:

- Policies and environment and safety management documentation;
- Legislation, standards and guidelines;
- Emergency contact information;

- Appropriate signs being displayed relating to fire, safety and PPE requirements;
- Emergency evacuation plans for the site;
- Safety alerts and technical bulletins;
- HS&E minutes; from six monthly HS&E meeting;
- Emergency drill reports; and
- The RCCA.

9.4 Monitoring, Auditing and Management of Non-Compliance

9.4.1 Monitoring

The PVGF is routinely monitored during operations by site personnel, external service providers, CP management. Monitoring is supported by the CP environmental personnel to ensure the management controls described in Section 8 are implemented and that the performance measures are achieved. Table 9-1 provides an outline of the main monitoring activities undertaken at the PVGF.

Table 9-1 Activities to monitor control effectiveness during Operations

Control	Monitoring	
	Action	Frequency
ALL		
Site inductions and training	Keep records of inductions and training to ensure 100% participation by all relevant personnel, contractors and visitors	For all new staff members and visitors before access to the site Annual review of training records
ASSET INTEGRITY - SUBSURFACE		
Gas extraction	Monitoring of wellhead pressure (producing wells)	As outlined in Table 6.3 of the FEMP
	Monitoring of wellhead pressures (non-producing wells)	As outlined in Table 6.3 of the FEMP
	Monitoring of identified water bores	Annually
ASSET INTEGRITY – SURFACE FACILITIES		
Gas processing	Routine testing, inspection and preventative maintenance program for gas field infrastructure	Per inspection regime within CP's maintenance management system (CMMS)
	Monitoring of plant conditions	Daily
CHEMICAL AND HAZARDOUS MATERIALS MANAGEMENT		
Storage of chemicals, fuel and oils	Routine visual inspection of storage areas to ensure no leaks or spills	Weekly
	Visual inspection to ensure adequate bunding and containment strategies implemented	Quarterly
Spills and leaks of chemicals, fuel and oils	Routine emergency response drills	Monthly
	Groundwater monitoring	Annually
PRODUCED WATER MANAGEMENT		
Produced water storage	Routine reading of wellhead tank liquid levels	Daily
	Visual inspect evaporation pond to ensure sufficient free-board	Weekly

	Routine recording of water volume drained from the leak detection system of the evaporation pond to monitor integrity of below water liner condition	Weekly
	Visual inspect of evaporation pond liner integrity above ground level	Monthly
	Groundwater monitoring	Annually
WASTE MANAGEMENT Decommission and rehabilitation activities		
Waste receptacles	Visual inspection of waste receptacles to ensure no fauna access to waste storage locations, lids are secure, waste are appropriately stored and there are no leaks	Weekly
Waste handling	Audit waste register to ensure all waste removal is appropriately captured and recorded	Monthly
EROSION AND SEDIMENT CONTROL		
Erosion and sedimentation on site	Visual site inspection to ensure appropriate erosion and sedimentation control measures implemented	During civil maintenance works
Erosion control	Visual site inspection ensuring adequate control devices in place in accordance with DENR and IECA best practice guidelines	Following any significant rainfall events (>10mm in 24 hours)
DECOMISSIONING AND REHABILITATION MANAGEMENT		
Decommission and rehabilitation activities	Visual inspection of rehabilitation areas	Yearly
Decommission and rehabilitation activities	Photographic point monitoring before, during and after rehabilitation	As required before, during and after rehabilitation works
BIOSECURITY MANGAEMENT		
Weed-free certification	Spot check for weed free certificates when equipment and materials are mobilised to site from known weed infested areas	Ad hoc
Weed management	Inspection to identify weed outbreaks	Quarterly
BIODIVERSITY MANGEMENT		
Ecological assessment	Ecological surveys for flora and fauna	Prior to any civil maintenance
Routine inspection	Visual inspection to ensure no disturbance to known Slater Skink habitat north of PV-02	Twice per year
BUSHFIRE PREVENTION		
Fire control equipment	Inspect fire control equipment to ensure functionality	Monthly
Fire control	Inspect fire breaks	Yearly

AIR QUALITY PROTECTION MEASURES		
Emissions	Maintenance records of vehicles and equipment	Per inspection regime within maintenance management system (CMMS)
Venting	Record of all venting events	During operations as required
Complaints	Record of complaints from surrounding land users in regard to air quality or visual amenity	Records kept when applicable
Dust	Monitoring of road conditions	Weekly
TRAFFIC AND TRANSPORT MANAGEMENT		
No unauthorised off-road driving, all drivers inducted into the potential impacts of off road driving on soil	Records kept of any incidents	During operations as required
Fauna strike	Records kept in a fauna register of any sightings, near misses or strikes	During operations as required
Zone designated speed limits	Records of any failures to comply and corrective action taken	During operations as required
COMMUNITY IMPACT MINIMISATION		
Complaints	Records of complaints from surrounding land users in regard to noise and vibrations from operations	Records kept of any incident when applicable
CULTURAL HERITAGE AND SACRED SITES PRESERVATION		
Interference with Aboriginal sacred sites, places or objects of archaeological significance.	Records kept of any incidents	Records kept of any incident when applicable
SOIL		
Soil contamination	Soil sampling directly after clean up at any location where spill/contamination has occurred Soil testing of any area of remediation following spill/contamination if applicable	As required, following incident, until soil is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites
SURFACE WATER		
Surface water contamination	Water/soil sampling directly after incident to determine extent of contamination and following removal of contamination source	As required, following incident, until soil/water is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites and/or appropriate surface water guidelines

9.4.2 Auditing

In addition to regular monitoring as set out in Table 9-2, inspections and audits assessing compliance with this FEMP will be undertaken by a 'suitably qualified person'. System deficiencies, adverse or potentially adverse environmental conditions arising from site activities may be subject to the issue of environmental non-conformances. These non-conformances and the suitable corrective actions will be entered into the CP Environmental Register for tracking of action progress to closure.

As per Table 9-2, CP undertakes site inspections weekly to assess conformance to the FEMP, every week a different aspect of the FEMP will be assessed. Assurance audits of implementation of the FEMP commitments will be completed annually and included in the annual environmental report.

Note: Suitably qualified person - means a person who has the abilities, formal qualifications, relevant experience or potential to acquire, within a reasonable time, the skills and competencies necessary to perform a particular job.

Table 9-2 FEMP Audit Schedule

Audit Type	Scope of Audit	Frequency	Responsibility
Site Inspections	Checklists inspections of activities approved under this FEMP. Items to be actioned as required	As per Table 9-1	HSE Representative, Site Supervisor, delegate or Environmental Consultant
Annual Assurance	Compliance against FEMP commitments and risk management controls	Annually	CP HSE Representative or Environmental consultant

9.4.3 Continuous Improvement

CP is committed to continual improvement in its HS&E performance and develops improvement plans in accordance with HS&E Management Standard 4 – Improvement Plans (IP). The content of a HS&E Improvement Plan (IP) supports:

- strategic improvement initiatives,
- actions necessary to address compliance deficiencies and audit findings (including from the inspections and audits required under the FEMP); and
- opportunities to improve environmental outcomes, reduce key risks and improve environmental performance through changes in process, new technologies and/or changes in implementation of an activity to meet CP's environmental objectives.

9.4.4 Incident and Non-Conformance Management

CP's incident management procedures are designed to:

- Ensure all near misses and incidents are reported in a standard format so that consistency and accuracy of the process is maintained;
- Identify the underlying and basic causes of all near misses and/or incidents;
- Implement mechanisms to prevent the recurrence of similar near misses/incidents;
- Provide information to prepare the CP near miss/incident statistics, and
- Identify potential losses and suitable corrective actions.

It is CP's policy to report and investigate near misses, major hazards and incidents and to implement action to mitigate any identified contributing factors.

Incident management procedures are detailed in the CP HS&E MS.

Environmental incidents that may arise during PVGF operations include:

- Well control event;
- Well integrity failure;
- Petroleum, saline produced water, grey water, chemical or sewerage spills (including uncontrolled escapes);
- Introduction and spread of weeds, invasive species or flora and fauna diseases;
- Fauna injury/fatality (vehicle collisions);
- Vegetation die back adjacent to the operational site;
- Uncontrolled fire;
- Clearing of threatened flora species;
- Clearing of threatened fauna species habitat; and
- Disturbance to heritage areas.

All environmental incidents and near misses that arise due to the presence of hazards on site are reportable to CP management for inclusion in the incidents/near misses register. External reporting will follow the requirements set out in Section 10.2.

9.5 Emergency Contingency Plan

CP's emergency planning includes:

- Emergency response plan, manual and procedures (Appendix 9);
- Dedicated trained emergency response personnel;
- Dedicated emergency response vehicles and equipment;
- Emergency simulation training exercises (drills); and
- Preventative maintenance programs.

Types of emergency situations that may arise during PVGF Operations include:

- Spills – chemical or hazardous substance (particularly hydrocarbons and saline water);
- Fire (bushfire or as a result of operations);
- Medical;
- External Communications (E.g. bomb threat).

in Appendix 7 provides an overview of key emergency response documents relating to the PVGF.

CP will ensure all personnel, contractors and visitors are aware of the emergency response framework and are adequately trained in emergency response procedures relevant to their role/position.

CP's Emergency response plan, manuals and procedures are reviewed and up-dated to incorporate new information arising from incidents, near misses and emergency simulation training sessions.

9.6 Record Keeping

The list of environmental records that will be kept on site, includes:

- Induction records;
- Waste stream records including type and quantity;
- Incident register;
- Hazardous materials manifests;
- Diesel fuel usage;
- Weed species control efforts;
- Non-compliances and corrective action records;
- Internal audits and inspection records;
- External audits;
- Vehicle and plant maintenance records;
- Site access register;
- Road and infrastructure maintenance records;

- Water usage;
- Produced water volumes; and
- Environmental survey and sampling work results.

10 REPORTING

10.1 Routine Reporting

The reports in Table 10-1 will be maintained and submitted to the DPIR as stipulated for compliance:

Table 10-1 Routine Reporting Frequency

Report	Internally Recorded	Submitted to the DPIR
Annual Environmental Report	Updated monthly – collating the daily, weekly and monthly reports	Annually
Incident and Contaminated Site Reports	1. Initial report 2. Progress reports 3. Final reports	90 days after completion

10.1.1 Annual Environmental Report

Annual environmental reporting of the PVGF operations is prepared for continual operational and environmental management improvement and submitted annually to DPIR. The scope of the report includes:

- Operational activity and facility status/changes;
- Environmental incidents (recordable and reportable); investigation and close out summary;
- Environmental monitoring status and results;
- Rehabilitation (see Section 11.4);
- Stakeholder Consultation;
- Environmental programs and studies; and
- Results of audits and regulator visits.

10.2 Incident Reporting

Internal incident management and reporting requirements are outlined in Section 9.

In accordance with legislative requirements, environmental incidents at the PVGF may also be reportable to external stakeholders (government, the CLC, non-government organisations, etc.).

All required incident reports shall be made formally in writing to external stakeholders with copies sent to applicable CP managers, with incident details registered into the database.

10.2.1 Reportable Incidents

For environmental incidents that occur off of the OL3 area (e.g. an incident that occurs on a road not under the control of CP) as defined under Section 14 of the *Waste Management and Pollution Control Act,* CP will report to the NT EPA on their Pollution Hotline **1800 064 567** as soon as possible (at most within 24 hours).

Under the *Petroleum (Environment) Regulations 2016*, a reportable incident means an incident arising from a regulated activity that has caused, or has the potential to cause, material environmental harm or serious environmental harm as defined under the *Petroleum Act Division 2*. Therefore, CP will adhere to legislative incident reporting requirements; by reporting to the DPIR forthwith or as soon as practicable of an incident involving:

- Liquid petroleum spills greater than 300 L (80 L in areas of inland waters);
- Petroleum in a gaseous form greater than 500 m^3; and

- Uncontrolled escapes or ignitions of petroleum or any other flammable or combustible materials

In this case, CP will notify (this may be oral or in writing) the DPIR through the Operations Team Emergency number: **1 300 935 250** of a reportable incident as soon as practicable but no later than 2 hours after the first occurrence of the incident or after the time CP becomes aware of the incident.

If there is any doubt about whether the incident is a reportable incident, CP will not hesitate to report the incident and work with the regulator to minimise the consequences and deal with the incident efficiently.

If it is confirmed that the incident is a reportable incident, a written report must be submitted within three (3) days. The report will contain:

- all material facts and circumstances about the incident;
- information about any action taken to avoid or mitigate adverse environmental impacts;
- information about any corrective actions necessary to prevent re-occurrence of a
- similar incident;
- details and timing of any further corrective actions required (such as a full root cause
- analysis and investigation); and
- if applicable, a proposed date for the submission of a closeout report to the Minister.

In addition, CP will provide a final report about a reportable incident 30 day after the clean up or rehabilitation of the area affected by the reportable incident is completed.

The final report must include a comprehensive and detailed root cause analysis of the reportable incident. At no longer than 90-day intervals, progress reports will be submitted about the incident investigation and steps taken to mitigate any environmental harm.

10.2.2 Recordable Incidents

All recordable incidents are required to be reported to the DPIR in accordance with section 35 of the Petroleum (Environmental) Regulations.

The Petroleum (Environmental) Regulations 2016 define a recordable incident as an incident arising from the activity that breaches an environmental objective or performance standard as per Schedule 8 of this FEMP that applies to the activity, and is not a reportable incident (Section 10.2.1). CP will maintain a register of recordable incidents.

11 REHABILITATION MANAGEMENT

11.1 Scope

The rehabilitation management plan applies to the whole of the OL3 area, including:

- Decommissioning and removal of infrastructure;
- Well plug and abandonment;
- All cleared surfaces and disturbed sites;
- Residual contamination;
- Removal of access roads;
- Revegetation; and
- Soil stability.

11.2 Objectives

- Remove all infrastructure and decommission plant
- Return all disturbed areas to a safe and stable landform as close as possible to the surrounding environment
- Ensure final landform is conducive to the re-establishment of native vegetation
- No residual contamination
- No land management issues for future land managers

11.3 Actions and Monitoring

Table 11-1 details the actions required to meet the environmental requirements for rehabilitation and monitoring in order to determine that these objectives have been achieved. An auditing schedule is to be included in a more detailed Decommissioning and Rehabilitation Plan developed closer to the time of closure.

Table 11-1 Rehabilitation and Closure Plan Management Action and Monitoring Requirements

Activity	Factors Assessed/Actions	Timing
Decommissioning	• Removal of above ground infrastructure • Removal of rubbish • Re-spread vegetation • All RCCA items closed out to satisfaction of the DPIR	Commence within 12 months of site/infrastructure closure
Future land holders/managers	• Previous agreement for infrastructure or disturbed areas to be left for future land holders/managers (depending on the asset and its condition at the time of decommissioning and rehabilitation)	Before rehabilitation works commence
Soil Stability	• Remove any flow concentration points that may block overland sheet flow • Re-instate natural drainage channels • Return soil profile with top soil replaced as final layer where possible	Commence within 12 months of site closure

Activity	Factors Assessed/Actions	Timing
	• Deep ripping and contouring of access roads, cleared and compacted areas • Ensure all cleared areas have a rough surface to aid in water and seeds catchment • Re-spread vegetation • Erosion and sedimentation devices maintained and installed as appropriate to best practise guidelines by the DENR and IECA	
Revegetation	• Active re-seeding with local natives	To be assessed 12 months after initial seeding
Monitoring	Establish photographic monitoring points before and vegetation survey before disturbance, so to bench mark against in later surveys. The following monitoring program is proposed: • Immediately after rehabilitation works completed: *Check for integrity of works and ability for future rehabilitation success*; • Following first wet season: *Stability of soil, landform, vegetation type and re-growth and appearance of weeds*; • One year after rehabilitation: *Re-vegetation success*; • Yearly inspection: *weed, erosion & sediment control and management;* • Three years after: *Soil stability, landscape and vegetation re-growth and type after several wet seasons*; and • Five years after: *Long term rehabilitation success measured by landform stability and vegetation re-growth.* Photographic monitoring and vegetation surveys conducted at each monitoring event to compare progress.	As prescribed

11.4 Rehabilitation Reporting

As part of the Annual Environmental Report (Section 10.1), CP will submit to the DPIR an annual rehabilitation report with information including:

- Total area rehabilitated;
- Photographic monitoring points GPS locations and results;
- Any areas left in an agreement with future land holders/managers (depending on the asset and its condition at the time of decommissioning and rehabilitation)
- Monitoring of progressive rehabilitation, including flora type and density, fauna activity and soil stability;
- Any erosion and sedimentation issues;
- Any stakeholder consultations and results of discussions;
- Any issues noted and remedial actions taken (RCCA); and
- Monitoring of contaminated sites (RCCA).
- Weed monitoring

12 STAKEHOLDER ENGAGEMENT

12.1 Stakeholder Management

CP is committed to upholding its reputation with a range of stakeholders including:

- Community
- Landholders (in this case indigenous (CLC))
- Indigenous
- Government
- Other key non-commercial external stakeholders (e.g. NGOs and industry bodies)
- Industrial Relations stakeholders
- Other commercial external stakeholders
- Internal stakeholders

CP seeks to establish and maintain enduring and mutually beneficial relationships with the communities of which it is a part; ensuring that our activities generate positive economic and social benefits for and in partnership with these communities.

To achieve this CP holds an annual liaison committee meeting between CLC and local traditional owners and undertakes ongoing activities in accordance with the Local Content Plan and Social Performance Plan.

In the case of new projects and activities, CP will prepare a Stakeholder Management Plan (SMP) in accordance with the requirements of the *Petroleum (Environment) Regulations* to ensure effective engagement and management of stakeholders. The principal objectives of the SMP are:

- Identification of relevant stakeholders
- Initiation and maintenance of communications
- Identification of stakeholder engagement tools
- Establishment of an open and transparent process for input
- Provision of a means for recording all initiatives in which communication and/or consultation is undertaken, issues raised, and responses recorded
- Establishment of a sense of ownership in the project by stakeholders.

Stakeholders may be engaged through:

- Public release of key documents including any Environmental Management Plans;
- Stakeholder needs survey;
- Project newsletters;
- Public displays;
- Staffed Environmental Impact Statement displays;
- Regular updates to central website;
- Fact sheets;
- Native Title Representative Body meetings and briefings;
- Advertising and/or articles in relevant print media;
- Media briefings, releases, and monitoring;

- Responding to media enquiries;
- Community workshops;
- Public information sessions and meetings;
- Project Information Line and email;
- Written enquiry forms;
- Face to face meetings with stakeholders and stakeholder groups; and
- Other direct and indirect engagement mechanisms

12.2 Current Stakeholder Approvals

In the case of the PVGF, the stakeholders needing to formally approve this FEMP for operations are shown in Table 12-1.

Table 12-1 Current Stakeholder Approvals

Act	Stakeholder	Current Approval	Future Approvals
Petroleum (Environment) Regulations 2016	DPIR	OL3 activities approved under *Petroleum (Prospect and Mining) Act (repealed)* Updated EMP resubmitted to DPIR in 2018 in accordance with the 2016 *Petroleum (Environment) Regulations*	As per the Petroleum (Environment) Regulations, this FEMP must be resubmitted at least 90 days before the end of each 5-year period FEMP revision and resubmission required for new or increased environmental impact or environmental risk
Aboriginal Sacred Sites Act	CLC	CLC Sacred Sites Clearance 2004 (C2015-035) (Appendix 4)	No ongoing approval required for activities within existing footprint Approval required if there is an increase to the disturbance footprint

12.3 Stakeholder Approvals for Modified Activities or New Projects

The following approvals will be considered by CP when seeking approvals for new or amended projects or activities.

12.3.1 NT Government Approval

This FEMP has been designed to meet the requirements for an Environmental Management Plan as detailed in the document *Petroleum (Environment) Regulations: An Explanatory Guide 2016.* Should this guideline document be updated, the FEMP must also be reviewed and, if required, amended.

This FEMP has been developed to cover the operational activities undertaken at the PVGF operational areas. However, there may be a requirement, on occasion, to modify the operational activities or conduct new projects that are not described in the FEMP.

Under the *Petroleum (Environment) Regulation* Section 17, modifications to regulated activities triggers a revision and subsequent approval of this FEMP if the activity is associated with a new or increased environmental impact or risk not covered by this FEMP. In this case there will be a need to provide additional supporting information on the activity, nature of the impact and management of hazards.

If, however the modified activity's environmental impacts and risks are covered by the FEMP, revision of the FEMP is not required. As per section 22 of the *Petroleum (Environment) Regulation*, CP must

give the NT Government notice which requests approval for the modified activity and states that the hazards will be controlled as per the approved FEMP.

According to Section 23 of the *Petroleum (Environment) Regulations,* a revision is also not required if there is a change to the existing environment that is described in the current FEMP and the change is not associated with a new or increased environmental impact or risk (noting that if there is a new or increased impact or risk, a revision may be triggered). In such an event, CP will provide the NT Government with notice that specifies the details of the change.

New projects involving regulated activities not covered by this FEMP will trigger a new EMP to be developed and submitted to the NT Government according to the requirements of the *Petroleum (Environment) Regulation.* Examples of activities requiring a separate EMP and approval are shown in Table 6-2.

To define the process for providing the NT Government additional project-specific information for new projects / programs at the PVGF, an Activity Specific Environmental Management Plan template has been developed. The template is based on *HS&E MS09.5 Environmental Impact Assessment & Approvals*, and sets out the information to address the DPIR's requirements for an Environmental Management Plan as per the *Petroleum (Environment) Regulations: An Explanatory Guide 2016*, in particular:

- Description of the Project Activity.
- Description of the Project Environment.
- Reporting (activity specific).
- Consultation.

It is noted that for a significant activity / project change, the NT Government may require assessment under the *Environmental Assessment Act 1982,* i.e. the preparation of a Public Environmental Report (PER) or Environmental Impact Statement (EIS). This could also be initiated if the Commonwealth assessment process is triggered, as discussed below.

Relevant legislative requirements for approvals will be reviewed for any new projects and activities within PVGF in consultation with the NT government petroleum regulator

12.3.2 Matters of National Environmental Significance (MNES)

12.3.2.1 Overview of the EPBC Act

A check needs to be made in relation to any new activity / project on whether the Commonwealth *Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999* is triggered. The proponent can self-assess whether a proposal impact is significant and this will be assessed by the Territory government (DPIR or subsequently DENR EPA) who may agree or require that it be assessed further including under EPBC Act. Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Australian Commonwealth Minister for the Environment. The Minister will decide on the basis of data or reports submitted whether assessment and approval are required under the EPBC Act.

The nine MNES protected under the EPBC Act are:

1. world heritage properties
2. national heritage places
3. wetlands of international importance (listed under the Ramsar Convention)
4. nationally threatened species and ecological communities
5. migratory species
6. Commonwealth marine areas

7. the Great Barrier Reef Marine Park
8. nuclear actions (including uranium mining)
9. water resource in relation to coal seam gas (CSG) and large coal mining (the water trigger).

In addition to the above, actions that may have a significant impact on Commonwealth land (even if taken outside Commonwealth land), and actions taken on Commonwealth land that may have a significant impact on the environment generally, are also covered by the EPBC Act.

The approval process is initiated by preparing a Referral under the EPBC Act, which would be used in order to determine the level of assessment (if any further is required). If it is determined through the Referral process that an action does require the Minister's approval, i.e. is a Controlled Action under the EPBC Act, then that action must be assessed. As a bilateral agreement is in place with the NT Government, the NT can assess the action under the terms of the agreement. However, in the assessment process, the Commonwealth will also consider whether any conditions (additional to any Territory conditions) should be required to meet any specific Commonwealth requirements, e.g. to protect any listed Commonwealth flora or fauna species.

As part of the Referral process, an EPBC Act Protected Matters Search Report (PMSR) needs to be prepared for the area of interest, supported by any survey or other work as considered necessary to enable assessment of whether any MNES have been triggered.

The Department of Environmental and Energy (DoEE) have issued Significant Impact Guidelines to clarify what may constitute a significant impact on MNES. These guidelines outlines a set of criteria for each MNES and outlines the types of actions and impacts that may be considered as significant. The two criteria used for the assessment are:

- Is the proposed action likely to have a significant impact on a matter of national environmental significance and:
- Is the proposed action likely to have a significant impact on the environment in general or the environment on Commonwealth land

12.3.2.2 EPBC Self-assessment

An EPBC Act Protected Matters Search Report (PMSR) was prepared for the OL3 area (Appendix 3), which was supported by historical ecological surveys undertaken in 2007 by Low Ecological Services (Ghee & Low, 2007) to enable assessment of whether any impacts to MNES have been triggered.

As PVGF has been in operation in its current state for a long period of time and there have been no incidents or impacts on the threatened species identified as potentially occurring within OL3, continuation of operations under the current intent of resuming operation of the long established PVGF operational areas does not require conservation species specific management plans or mitigation measures. However the presence of the isolated slater skink individuals immediately north of PV2 operational lay down area has resulted in site specific mitigation measures including sediment control banks and flagging of the site to be avoided to minimise risk to slater skinks within the lease area

The impact on any threatened species in the area was assessed to be at an individual animal/plant scale and would not have an impact on the population of the species concerned. All threatened species in the area are relatively wide spread at low population levels, with little evidence of their presence in the areas being worked in, thus impact on an individual may result in disturbance or death of an individual, but reinvasion from adjacent areas will be likely.

EPBC referral was not sought as:

- the proposed action is not likely to have a significant impact on a matter of national environmental significance and:
- the proposed action is not likely to have a significant impact on the environment in general or the environment on Commonwealth land

12.3.3 Traditional Owner Approvals

Approval from the TOs is required for any new activities at the PVGF operations involving ground disturbance, including:

- Survey work;
- Drilling;
- Construction of petroleum gathering and processing facilities;
- Access roads;
- Pipelines; and
- Camp and ancillary facilities.

This requirement is detailed under Clause 5.2 and Clause 5.3 of the Palm Valley Agreement (2003), which is a legal agreement between CP and its Joint Venture partners and the CLC (the body corporate representing the TOs).

As part of this approval process, inspection by TOs and/or a professional Archaeologist may be required to finalise locations for proposed activities involving ground disturbance (Signed section of the agreement found in Appendix 4).

Once locations are finalised, and prior to any site activity, further field inspection reports are undertaken for each location, in accordance with the CP HS&E MS.

12.4 Summary of Matters Discussed

A summary of any matter discussed with stakeholders is recorded in the CP PVGF Communications Log (Appendix 5). This log is updated following any stakeholder consultation and submitted to the regulator in the annual environmental report.

12.5 Assessment of Merit of Stakeholder Objection or Claim

At present there has been no stakeholder objection, claim or dispute that has required resolution. If there are any disputes CP will follow the conflict resolution process outlined in the Consultation and Communication procedure (MSTD07-01 (v1)). This assessment of the objection or claim will be recorded in the Communication Log and submitted to the regulator in the annual environmental report.

12.6 Statement of Intent Holders Response

CP will issue a statement of response to any stakeholder objection or claim to resolve the conflict or dispute in line with the Consultation and Communication (MSTD07-01 (v1)) procedure. This will be recorded in the Communication Log and a copy of the statement of response will be kept on file for inclusion in the annual environmental report and available for view in audits.

12.7 Details of Changes Due to Engagement

Any changes in operations, policy or procedures because of stakeholder consultation or other engagement will be recorded in writing. CP Management will review and assess any changes for merit and if deemed necessary to be undertaken these changes will approved by CP management before any action is taken. Where required, CP management will submit details of the proposed changes to the regulator for approval. A summary of any changes to operations that derive from stakeholder consultation or other engagement will be included in the annual environmental report and reflected in future versions of this FEMP.

12.8 Ongoing Consultation

CP maintains a record of all ongoing interactions and communications with stakeholders and affected parties to the PVGF. This information is maintained in a Communication Log. A copy of this will be submitted to the DPIR annually. The communication log to date is provided in Appendix 5.

It details:

- Date;
- Topic discussed;
- Type of engagement;
- CP contact;
- Primary stakeholder; and
- Outcomes – Any issued resolved or identified.

13 BIBLIOGRAPHY

Ahmad, M., 2000. *Geological Map of the Northern Territory, 1:2,200,000,* s.l.: Northern Territory Geological Survey.

Anon., 2012. *Species Profile and Threats Database; Erythrotriorchis radiatus - Red Goshawk.* [Online]
Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=942australian_and_state/territory_government_legal_status
[Accessed 14 May 2013].

Anon., 2013. *Northern Territory Flora & Fauna Atlases,* Darwin: Department of Land & Resource Management (DLRM).

Australian Government, 2011. *Lake Eyre Basin.* [Online]
Available at: http://www.lakeeyrebasin.gov.au/about-basin
[Accessed 15 September 2016].

Baker, B. et al., 2005. *Northern Territory Bioregions - Assessments of Key Biodiversity Values and Threats.* Darwin: Departmentof Resources, Environment, the Arts and Sport.

Bureau of Meteorology, 2013. *Climate Statistics for Australian Locations: Monthly Climate Statistics - Alice Springs.* [Online]
Available at: http://www.bom.gov.au
[Accessed 17 June 2013].

Bureau of Meteorology, 2015. *Climate Statistics for Australian Locations: Monthly Climate Statistics - Alice Springs.* [Online]
Available at: http://www.bom.gov.au
[Accessed 10 October 2015].

Department of Natural Resources, Environment, the Arts and Sport, n.d.. *NRETAS Site of Conservation Significance: Greater Macdonnell Ranges.* [Online]
Available at:
http://www.lrm.nt.gov.au/__data/assets/pdf_file/0008/13886/55_greatermacdonnell.pdf
[Accessed 02 06 2015].

Department of the Environment, 2014. *What is protected under the EPBC Act?.* [Online]
Available at: http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/what
[Accessed January 2014].

Ecological Development Steering Committee, 1992. *National Strategy for Ecologically Sustainable Development - Part 1 Introduction.* [Online]
Available at: http://www.environment.gov.au/about-us/esd/publications/national-esd-strategy-

part1
[Accessed 5 July 2016].

Ghee, C. & Low, B., 2007. *Palm Valley Gas Field: Environmental Impact and Flora & Fauna Study,* Alice Springs: Low Ecologcial Services.

Meixner, T., Close, D.F., Scrimgeour, I.R. & Edgoose, C.J., 2004. *Mount Rennie, Northern Territory (First Edition) 1:250,000 interpreted geological map series, SF 52-15,* Darwin: Northern Territory Geological Survey.

Neave, H., Sparrow, B. & Clifford, B., n.d. *Preliminary Report: towards a resource assessment of the Burt Plain bioregion for conservation planning, biodiversity..* [Online] Available at: http://www.nt.gov.au/nreta/wildlife/nature/burtplain.html
[Accessed 1 April 2011].

North Australia Fire Information, 2016. *North Australia Fire Information website.* [Online] Available at: www.firenorth.org.au
[Accessed September 2016].

Northcote, K. H. et al., 1960-1968. *Atlas of Australian Soils, Sheets 1 to 10..* With Explanatory Data - Melbourne: CSIRO Australia and Melbourne University Press.

Northern Territory Department of Mines and Energy (DME), 2012. *Schedule of Onshore Petroleum Exploration and Production Requirements 2012 ,* Darwin: DME.

Parks and Wildlife Services of the Northern Territory, 2011. *Finkie Gorge National Park Joint Management Plan,* Alice Springs: Department of Natural Resources, Environment, The Arts and Sport.

Perry, R. A., Mabbutt, J. A., Litchfield, W. H. & Quinlan, T., 1960. *Land Systems of the Alice Springs Area ot the Northern Territory.* Canberra: CSIRO.

Perry, R. A., Mabbutt, J. A., Litchfield, W. H. & Quinlan, T., 1962. *Land Systems of the ALice Springs Area ot the Northern Territory.* Canberra: CSIRO.

White, M. et al., 2000. *Plant Species and Sites of Botanical Significance in the Southern Bioregions of the Northern Territory, Vol 1: Significant Vascular Plants.* Alice Springs: Arid Lands Environment Centre.

Wilson, B. A., Brocklehurst, P. S., Clark, M. J. & Dickinson, K. J. M., 1991. *Vegetation Survey of the Northern Territory Australia.* Darwin: Conservation Commission of the NT.

Wischusen, J. D., Fifield, J. K. & Cresswell, R. G., 2002. *The Hydrogeology of Palm Valley, Central Australai. Report 01/1993A,* Darwin: Water Resources Division, NT Department of Infrastructure, Planning and Envrionment.

14 APPENDICES

Appendix 1 Letter Authorising Grey Water Disposal

Fax sent by : 61 8 89996527 DBIRD MINES DIVISION 23/12/03 15:07 Pg: 1

Northern Territory Government
Department of Business, Industry & Resource Development

Mines and Petroleum Management
5th Floor, Centrepoint Building
48-50 Smith Street Mall
DARWIN NT 0800

GPO Box 3000
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AUSTRALIA
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Ref: C03.355.cja

Mrs Jo-Anne Coleman
Petroleum Environmental Engineer
Magellan Petroleum Australia Limited
GPO Box 2766
Brisbane QLD 4001

RECEIVED
23 DEC 2003
c.c. LNA, JEC, MDA, TGO, AVC, BMcI, JPM, JP, TECH, File
READ

Dear Mrs Coleman

I refer to your correspondence of 24th November 2003 (your ref: 3602JECrms.doc) regarding proposed changes to existing waste water disposal arrangements at the Palm Valley Gas Lease.

The Department accepts the proposed actions outlined in your correspondence, including the additional commitment to retain samples of the waste water for verification if required.

Impacts on the receiving environment of this disposal process should continue to be assessed and if any issues arise they should be communicated to the Department within the appropriate timeframe.

I trust that your operation proves successful and please do not hesitate to contact the Department on (08) 89996528 if any advice or assistance is required.

Yours sincerely

RA McGILL
Director – Mines and Petroleum Management

23/12/03

23-DEC-2003 16:11 61 8 89996527 94% P.01

Appendix 2 Water reinjection approval PV-04 well

29-SEP-2004 11:36 MAGELLAN PETROLEUM BRIS 61 7 38321234 P.04/04

Northern Territory Government
Department of Business, Industry & Resource Development

Minerals and Energy
Energy Division
4th Floor, Centrepoint Building
48-50 Smith Street Mall
DARWIN NT 0800

GPO Box 3000
DARWIN NT 0801
AUSTRALIA
Telephone: +61 8 8999 5263
Facsimile: +61 8 8999 5330

Our Ref: File No.M2004/0045, C04.104.jg

Mr Larry Franks
Operations Manager
Magellan Petroleum Australia Limited
GPO Box 2766
Brisbane QLD 4001

Fax 07 3832 6411

Dear Mr Franks

RE: PALM VALLEY PRODUCED WATER RE-INJECTION PROJECT

Thank you for your letter of 27 September 2004 about the above subject.

I have no objection to Magellan continuing to re-inject produced water into Palm Valley-4 observation well providing you the apply the conditions described in your letter of 27 September 2004.

If you have any queries in respect of the matter please contact James Groombridge, on 08 8999 6023.

Yours sincerely

Tony McGill
Director of Mines
Mineral & Energy
29 September 2004

RECEIVED
29 SEP 2004
cc LNT, MDS, SEL, JP, TGP, MVE, BM, I, JPP, PSL, TELH FILE, READ

29-SEP-2004 10:33 61 8 89996527 96% P.01
TOTAL P.04

Appendix 3 EPBC Protected Matters Search

Australian Government
Department of the Environment

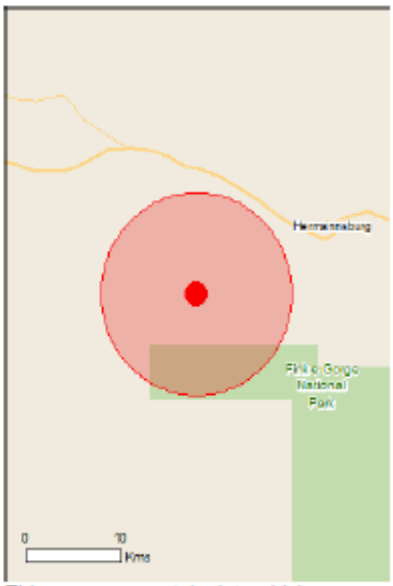
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 06/04/16 13:58:15



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	15
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	13
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Insects		
Croitana aestiva Desert Sand-skipper, Aestiva Skipper [26238]	Endangered	Species or species habitat may occur within area
Mammals		
Dasycercus cristicauda Crest-tailed Mulgara [328]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis MacDonnell Ranges race Warru, Black-footed Rock-wallaby (MacDonnell Ranges race) [66649]	Vulnerable	Species or species habitat known to occur within area
Zyzomys pedunculatus Central Rock-rat, Antina [68]	Endangered	Species or species habitat may occur within area
Other		
Macrozamia macdonnellii MacDonnell Ranges Cycad [11843]	Vulnerable	Species or species habitat known to occur within area
Plants		
Livistona mariae Central Australian Cabbage Palm [2036]	Vulnerable	Species or species habitat known to occur within area
Minuria tridens Minnie Daisy [13753]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Thryptomene wittweri Mountain Thryptomene [16645]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Liopholis kintorei Great Desert Skink, Tjakura, Warrarna, Mulyamiji [83160]	Vulnerable	Species or species habitat may occur within area
Liopholis slateri slateri Slater's Skink, Floodplain Skink [83163]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Finke Gorge	NT

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-23.99865 132.65067

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Appendix 4 Signed CLC Palm Valley Agreements

SIGNED for and on behalf of)
MAGELLAN PETROLEUM (N.T.) PTY LTD)
)
By THOMAS GWYNN DAVIES) .....
its duly authorised Attorney under Power of
Attorney dated 16 April 2004
who hereby states that he has no notice of
revocation of the said Power of Attorney at
the time of execution of this instrument, in
the presence of:

.....
Witness

M. V. COWIE
Name

SIGNED for and on behalf of)
SANTOS LTD)
FARMOUT DRILLERS PTY LTD)
CANSO RESOURCES PTY LTD)
SANTOS EXPLORATION PTY LTD) .....
)
By JOHN RODERICK BRUCE)
its duly authorised Attorney under Power of)
Attorney dated 21 APRIL 2004)
who hereby states that he has no notice of)
revocation of the said Power of Attorney at)
the time of execution of this instrument, in)
the presence of:)
)

.....
Witness

M. V. COWIE
Name

Page 51

THE COMMON SEAL of the Central Land Council was hereunto affixed according to law and in the presence of:

WILLIAM BROWN
Chairman

COUNCIL CENTRAL

Deputy Chairman
Executive Member

Name	Signature
CONRAD. RATARA	CONRAD. RATARA
MURRAY. RAGGETT	MURRAY. RAGGETT
Edwardal. Rontji.	Edwardal. Rontji.
Anita Ratara	Anita Ratara
Doris Inkamala	Doris Inkamala
Roberta Renkarraka	Roberta Renkarraka
DESMOND EBATARINGA	DESMOND. EBATARINGA
Cleophas Lefty Kakakaringa	Cleophas Lefty Kakakaringa

Page 52

THE COMMON SEAL of the Central Land Council was hereunto affixed according to law and in the presence of:

William Brown
Chairman

Deputy Chairman
Executive Member

Appendix 5 PVGF Communication Log

COMMUNICATION LOG

(Palm Valley)

Date	Topic	Type of engagement (e.g. email)	CP contact	Stakeholder	Outcomes
7/12/2017	Proposed 1 well program. PV 13	Formal Sacred Site Approval letter	James van Rooyen	CLC / Traditional Owners	Proposed work scope, well locations and formal Sacred Site Clearance letter of approval granted for the PV 13 site.
24/10/2017	Proposed 1 well program. PV 13	Formal Sacred Site Application (via Email)	James van Rooyen	CLC / Traditional Owners	Proposed work scope, well locations and formal Sacred Site Clearance applied for through the CLC for the PV 13 well submitted to the CLC.
23/10/2017	Central Petroleum, CLC and Traditional owners stakeholder meeting (Liaison Committee meeting)	Site visit held at Palm Valley	Mike Herrington, Rolf Schulte	CLC, Conrad Ratara (Recognised T/O Elder) and representatives from Hermannsberg T/O stakeholders	Formal yearly meeting held between the traditional owners, the CLC and Central Petroleum. The past years operations were discussed and the future years operations planned. Maps and details of the new well PV 13 were reviewed and discussed with them at this point. T/O's took the maps and walked the proposed new well location. Initial verbal approvals granted.
20/10/2017	Proposed 1 well program. PV 13	notification (via Email)	James van Rooyen	CLC / Traditional Owners	Proposed work scope, well location and maps sent to CLC / traditional wonders as preparation for the LCM submitted to the CLC.
Apr-17	Hermannsburg/Ntaria school uniforms	Phone/email/on-site visit	David Liddle	Ntaria School	Gave donated sports shirts from St Hilda's College in Brisbane to Ntaria School. Discussed future exchange between St Hildas and Ntaria School.
May 2017	Hermannsburg sports sponsorship	Phone call/email/face to face	David Liddle	Ngurratjuta/Conrad Ratara	Sponsorship didn't go ahead.
20/06/2017	Fire on the rangers behind PV Plant	Phone call	Deidre White (on behalf of Paul Mc Clelland)	Tjuwampa Ranger	Fire on the other range visible from PV plant. Rangers notified of Helicopter control burn. (No issue)
March, 2017	Weed control at PVGF and Mereenie	Phone, email,	Paul Mc Clelland, Bill Low on behalf of CP, Alan Johnson	Tjuwampa Rangers under Craig LeRossignol, Malcom Kenny,	Rangers put through CP induction to work on Mereenie and PVGF doing weed control. Working towards contract for Rangers from CP for weed control.

				Fabian Raggatt, Christopher Ungwanaka	
01/12/2015 – 01/03/2016	Reactivation of the Lake Lewis ILUA for salt dumping	Verbal contact (phone)	Dale McNeill	Bob Gosford (CLC Lawyer)	In progress. Ongoing investigation of options for disposal of salt
27th/03/2015	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff and Angela Carpenter (LES)	CLC ranger coordinator (Craig Le Rossignol), TOs (Hector Ratara, Noel Pareroultja, Maxy Pareroultja and Cliffy Raggatt)	52nd Quarterly Photo Point Monitoring Report
01/03/2015 - 01/04/2015	New well – PV12 application.	Discussions and emails	James van Rooyen	CLC	Application for new wells lodged with CLC
24/11/2015	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff, Diana Gomez, Bill Low and Kye Mitchell (LES)	TO's and Tjuwampa Ranger were not available for the survey due to death of a Ranger in the community the day before.	54th Quarterly Photo Point Monitoring Report
7/08/2015	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff and Angela Carpenter (LES)	Tjuwampa Ranger	53rd Quarterly Photo Point Monitoring Report
25/06/2015	Palm Valley Operations review	Site Visit	Bob Liddel and Leo Abbot	TOs	Successful meeting on site at Palm Valley with T/O's and Bod Liddle
24/04/2015	Review proposed site for PV 12	Site Visit	Mark Hensel	TOs, CLC	Successful meeting on site at Palm Valley 12 with the T/O's, Bod Liddle and Mark Hensel from CP. Review of proposed well site for PV 12
4/03/2015	Review of previous activities at PV and future activities. Liaison and Advisory committee meeting	On site meeting Traditional Owners, CLC.	Richard Cottee, Mike Herrington and Bob Liddle	TOs, CLC	Successful on-site meeting with T/O, CLC and Central delegation to review past performance and upcoming programs, royalties and opportunities at Palm Valley

4/03/2015	Review of previous activities and upcoming activities for PV	Meeting	James van Rooyen	CLC	Successful meeting with the CLC and CP (JVR) at Alice Springs. Review of operations and opportunities
12/02/2015	Introductory communication between CLC and PV matters	Email	James van Rooyen	Julie-Ann Stoll	Successful introduction and subsequent phone calls made
30/01/2015	Requesting fuel for CLC/TO meeting at March 2nd Palm valley. Request was for fuel for the Abbott and Rattara families.	Email	James van Rooyen	Bob Liddle	Fuel supplied through Caltex Alice Springs
12/12/2014	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff, Bill Low and Angela Carpenter (LES)	TOs (Obed Ratara and Emmon Campbell)	51st Quarterly Photo Point Monitoring Report
25/09/2014	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff, Bill Low and Angela Carpenter (LES)	TO (Hector Ratara) and Tjuwampa Ranger (Emmon Campbell)	50th Quarterly Photo Point Monitoring Report
17/07/2014	Accompanied the survey to gain familiarisation and to provide observation skills, particular from the natural system Aspects	Site Visit	Field Staff, Bill Low, Angela Carpenter and Matt Digby (LES)	TOs (Hector Ratara and Obed Ratara)	49th Quarterly Photo Point Monitoring Report
10/07/2014	Central Lands Council and Traditional Owners Meeting at Palm Valley	Site Visit	Field Staff, Management, Central Lands Council and TO's	TOs	Operations and environmental updates - in field.
23/05/2013	Central Lands Council and Traditional Owners Meeting at Palm Valley	Site Visit	Field Staff, Management, Central Lands Council and TO's	TOs	Operations and environmental updates - in field.
Prior	Multiple contact - Magellan Petroleum - 20+ years of operation and community consultations	Multiple	Multiple	Multiple	Multiple

Appendix 6 Parks and Wildlife Biophysical Mapping - Vegetation Units by Schubert (Ghee & Low, 2007)

Biophysical Mapping- Vegetation Units

Adapted from original prepared by Andrew Schubert and used by Parks and Wildlife for the southern Krichauff Range area for application by Low Ecological Services in the northern Krichauff Range.

Group 1 – SS
Shallow to steep sandstone slopes with *Acacia macdonnelliensis*, *Callitris glaucophylla* and some Mallee and *Psydrax latifolium* over varied shrubs over *Triodia brizoides* and lesser *T. melvillei*. Few unique species although a number of highly characteristic species

Group 2 - DSS
Dissected slopes and summits with *Acacia macdonnelliensis, Callitris glaucophylla* and *Eucalyptus sessilis* over *Acacia melleodora* and *Triodia brizoides*. Occasional *Capparis mitchellii*. Heterogeneous habitat with a number of unique species including *Dicrastylis gilesii.*

Group 3 - SVSSD
Summits. Variable slopes and some drainage. *Acacia macdonnelliensis, A. aneura, Psydrax latifolia* and *Callitris glaucophylla* common dominants over various shrubs and *Triodia melvillei*. Some *Eucalyptus sessilis* and *Baeckea polystemonea.*

Group 4 - USS
Upper slopes and summits with *Acacia macdonnelliensis* and *Acacia kempeana* over variable shrubs including *Olearia ferresii, Capparis spinosa* over *Triodia melvillei.*

Group 5 - SMS
Slight to moderate sandstone slopes of lower altitude areas. *Acacia kempeana* and *Acacia ligulata* most common with some *Acacia aneura* and *Acacia bivenosa*. Various other species such as *Indigofera leucotricha* over *Triodia brizoides* and *Triodia melvillei.* Frequent *Senna* and *Solanum species*.

Group 6 - VL
Variable landform comprising undulating rocky hills and moderate slopes with drainage lines. Spinifex dominated slopes with scattered fire tolerant shrubs. Some occurrences of *Corymbia opaca*, *Hakea lorea*, *Olearia ferresii* and *Indigofera leucotricha.*

Group 7 - SGS
Slight to gentle slopes and summits with Mallees (typically *Eucalyptus sessilis*), *Acacia kempeana, A. ligulata* and stands of *A. aneura* in fire shadow zones. Various understorey shrubs including *Triodia brizoides* and lesser *T. melvillei.* Characteristic species include *Sarcostemma viminale* and *Acacia spondylophylla*. Unique species include Wispy Acacia only on a localised area of the northern slopes.

Group 8 - CSS
Cliffs, steep slopes and outcrops with *Callitris glaucophylla*, *Acacia kempeana* and some *Atalaya hemiglauca* over variable shrubs. Frequent *Triodia brizoides* and *T. melvillei*. A number of characteristic species including *Psydrax latifolia*, *Eremophila freelingii* and many unique species such as *Ptilotus obovatus*, *Capparis mitchellii, Capparis spinosa* and *Sida filiformis.*

Group 9 - GWRDL
Gorge walls, cliffs and rocky drainage lines in sandstone grading into creek lines with sandy to rocky bases. Variable species with changing topography. *Eucalyptus camaldulensis, Atalaya hemiglauca* and *Corymbia opaca* common towards base. Rocky gorge walls containing *Acacia aneura, A. kempeana, Eremophila freelingii, Rhagodia eremaea, Santalum lanceolatum, Indigofera leucotricha* over mixed grasses and Triodia. Many species occurring on shaded cliffs and gorges are also present in the adjacent creek lines resulting in this grouping.

Group 10 - VSS
Variable stony sandstone slopes. Mid to low altitude slopes with relatively sparse vegetation. *Acacia aneura, A.kempeana* and *A. tetragonophylla* with *Eremophila freelingii* over grass patches with occasional *Triodia*. Characteristic species include *Senna art. helmsii*, *Rhagodia eremaea* and *Solanum quadriloculatum.*

Group 11 - CF
Colluvial flats with some clay, grading into sand and alluvial deposits. *Acacia aneura, A.kempeana, Atalaya hemiglauca* over Sennas and Chenopods over soft grasses. Characteristic species include *Rhagodia eremaea,* while unique species include *Maireana georgei* and *Sporobolus actinocladus.*

Group 12 - SUP
Sandy undulating plains and dunes with variable canopy. *Acacia aneura* with *A. tetragonophylla* over *Eragrostis eriopoda.* Characteristic species include *Enchylaena tomentosa* while unique species include *Abutilon otocarpum.*

Group 13 - AF
Alluvial flats and banks with *Acacia estrophiolata, A. tetragonophylla, A. victoriae, Rhagodia eremaea* over grassy understorey. Characteristic species include *Ptilotus sessilifolius*, *Enchylaena tomentosa , Eragrostis eriopoda* and *Triraphis mollis*. Unique species are *Maireana scleroptera*. Often weedy sites with *Cenchrus ciliaris* and *Cynodon dactylon* .

Group 14 - SC
Species rich, sandy creek lines with *Eucalyptus camaldulensis* over various subdominant species. Characteristic species include *Themeda triandra, Eremophila longifolia* and *Triraphis mollis*. Shares species with groups 16 and 17 which are both riparian

Group 15 - CUP
Calcareous undulating plains and sandstone rises and minor drainage lines. *Acacia kempeana* and *A. tetragonophylla* over *Rhagodia eremaea*, *Senna art. artemisioides* and *Ptilotus sessilifolius* over either soft grasses or *Triodia brizoides*. Other characteristic species include *Sida filiformis* and *Enchylaena tomentosa*. Many species shared by riparian groups 16 and 17

Group 16 - WRB
Species poor weedy riverbank.

Group 17 - CMC
Diverse calcareous, moist creek lines, *Eucalyptus camaldulensis* over *Melaleuca glomerata* over various shrubs over *Eulalia aurea.* Other characteristic species include *Santalum lanceolatum, Brachycome ciliaris, Enneapogon oblongus*.

Appendix 7 Previous Management Documents for PVGF

Table below outlines the various documents that have been used over the years to manage the field operations, describe the surrounding environment and identify and assess risks to the environment.

Key Documents relating to Management of the PVGF

Date	Title	Description
2007	Palm Valley Gas Field Environmental Impact and Flora and Fauna Survey (REF: EIA, 2007)	Commissioned to ascertain the extent of any environmental impacts resulting from the operation of the PVGF. Included soil, flora, fauna, and fire impact field surveys. Specifically assesses current condition of rehabilitation and recovery of saline and glycol impacted areas
2014	Palm Valley Operations Manual (REF: OPSMAN, 2014)	Developed to describe the principal operations and systems at the PVGF
2015	Palm Valley Photo Point Monitoring (Ref: PPM, 2002 - 2015)	Regular monitoring and reporting which aims to detect and manage any environmental issue to the regulator's requirement.
2016	Health, Safety, Security & Environment Handbook (Ref: MSTD06-PV-BK001_v2)	Developed to provide information and guidelines and to establish clear health and safety procedures and policies that will allow the PVGF and all facilities at the field to be operated efficiently and safely

Table below outlines the key emergency response plans relevant to PVGF.

Key emergency Response Documents Relevant to the PVGF

Document Title	Description
CP Emergency Response Plan (ERP)	Details the high-level arrangements to prepare for, respond to, manage and recover from any realistically foreseeable crisis associated to CP
CP Incident Investigation Procedures	Details the requirements for the reporting and investigation of incidents and to establish root causes, ensuring preventative actions to be planned and implemented.

Appendix 8 PVGF Hazardous Chemical and Goods Register

HAZCHEM Goods Register

Product Name	Substance Name	Storage location	Hazardous Goods (Yes / No)	Dangerous Goods (Yes / No)	Class & Packaging group	Quantity	Comment
Aeroclean Degreaser	Degreaser	Work Shop Flamable Liquids Cabinet	No	Yes	Class 2	500Ml/tin X 20	parts cleaning in the workshop and field
Aerogard	Tropical Strength	Camp/Office	No	Yes	Flammable Gas 2	200Gm/tin X 12	Mosquito and Fly repellent
Air Wick	Freshmatic Automatic spray	Camp/Office	No	Yes	Flammable Gas 2	174Gm/tin X 12	Air Freshener
Ajax Injection Fluid	Lubricant	Top Shed	Yes	No			
AJAY	Spray & wipe	Work Shop Flamable Liquids Cabinet					
AmbiPure	Air freshener	Camp/Office	No	Yes	Flammable Gas 2	265Gm/tin X 12	Air Freshener
Apparent	Glyphosate 450	Work Shop Flamable Liquids Cabinet					
Aqua Cure	Spa Gene Bromide Tablets	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1479 Oxidising Agent 5.1	500Gm/tin X 2	Spa water cleaning
ASCC	Blue Kerosene	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3/UN1223	20Lts	
ATF	Carpet cleaner	Work Shop Flamable Liquids Cabinet					
Auto Spec	Brake Cleaner	Work Shop Flamable Liquids Cabinet	No	Yes	Class 2	500Ml/tin X 20	parts cleaning in the workshop and field
Bactron AUK-550	Biocide	Top storage Shed	Yes	Yes	6.1		
Bagon	Insect spray	Work Shop Flamable Liquids Cabinet					
Bars & Bags	Windscreen cleaner	Work Shop Flamable Liquids Cabinet					
Borax	Glitz green cleaner	Work Shop Flamable Liquids Cabinet					
Bostik	Plumb-Weld PVC Priming Fluid	Work Shop Flamable Liquids Cabinet	No	Yes	Flammable Liquid 3	500Ml/tin X 2	PVC pipe fabrication/repairs workshop and field
Bostik	Plumb-Weld PVCpipe cement	Work Shop Flamable Liquids Cabinet	No	Yes	Flammable Liquid 3	500Ml/tin X 2	PVC pipe fabrication/repairs workshop and field
Bostik	Expanding Foam	Work Shop Flamable Liquids Cabinet					
BP Australia Ltd	Wonder Clean	Wash Bay	Yes	No		20 Lt	Cleaning vehicles and parts
Bunnings	Feed and Weed	Work Shop Flamable Liquids Cabinet					
Bushman	Personal Insect Repellent	Camp/Office	No	Yes	Flammable Gas 2	130Gm/tin X 12	Mosquito and Fly repellent
Caltex Australia Petroleum	Kopr-Kote		Yes			10 X 500ml jar	Anti sieze on bolts
Castrol QB 100	Degreaser	Top Shed	Yes	No		205 Lt	Cleaning equipment
Champion Servo	Scortron SGR-4330	PV 4	Yes	NO			Water injection
CLR	Industrial strength	Work Shop Flamable Liquids Cabinet					
CRC	Silicone spray	Work Shop Flamable Liquids Cabinet					
CRC	Adhesive lubricant	Work Shop Flamable Liquids Cabinet					
CRC Industries	Brakleen	Work Shop Flamable Liquids Cabinet	Yes	Yes		20 X 250ml tin	Brake and general cleaning
CRC Industries	Contact Cleaner	Instrument W/shop	Yes	No			Cleaning circuit boards etc.
CRC Soft Seal	Long term protection for metal surfaces	Work Shop Flamable Liquids Cabinet	Yes	Yes	Class 2	300Gm/tin X 5	etal/compressor parts protection in the workshop and fiel
Dettol	Glen 20 Spray Dissinfectant	Camp/Office	No	Yes	Flammable Gas 2	300Gm/tin X 12	dissinfectant spray
DIESEL FUEL	Petroleum distillate	Fuel Bund	No	Yes	Class 3 / Pack group 111	200lts	Refueling plant & equipment
Diggers	Mineral Turpentine	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3/UN1300	20Lts	Workshop- parts cleaning etc
Diggers	Methylated Spirits	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3/UN1300	1Lt bottle X 2	
Dullux	Quit rust paint	Work Shop Flamable Liquids Cabinet					

HAZCHEM Goods Register

Product Name	Substance Name	Storage location	Hazardous Goods (Yes / No)	Dangerous Goods (Yes / No)	Class & Packaging group	Quantity	Comment
Dupont	Velpar L Herbicide	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3	4 Lt tin	No longer holding product on site
Dy-mark	Spray and mark paint	Work Shop Flamable Liquids Cabinet					
Easy slide	Lubricant	Work Shop Flamable Liquids Cabinet					
Epirez Stag Jointing Paste	sealant	Work Shop	Yes	No		1 Kg	
Galnet	Spray paint	Work Shop Flamable Liquids Cabinet					
Galnet	Primer spray paint	Work Shop Flamable Liquids Cabinet					
Hi Tec oils DD 50 Coolant Red	Radiator Coolant	Workshop bunded area	Yes	No	Unclassified	20lts	
Hi Tech Oil traders	Parts Wash Solvent	Work Shop Flamable Liquids Cabinet	Yes	Yes	Class 3	40 Lt	Parts Cleaning
Inox	MX3 formula lubricant	Work Shop Flamable Liquids Cabinet	No	Yes	Class 2	500Ml/tin X 20	parts lubrication/protection in the workshop and field
Lithium Chloride			Yes	No			
Loctite	Instant Adhesive	Work Shop Flamable Liquids Cabinet					
Machinery Enamel	Caterpillar Yellow paint	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3	300G tin	
Methanol	Methanol		Yes	Yes	Class 3 / 2WE / Pack group 11	6000lts	1 x Bulk tank 5000lts / 1 x 1000lt bulky
Mobil DTE 26 oil	Lubricating oil	Work Shop Flamable Liquids Cabinet	Yes			40Lt	
Mortein	Fast Knockdown	Camp/Office	No	Yes	Flammable Gas 2	200Gm/tin X 12	Mosquito and Fly killer
Motortech	Apholstry and carpet cleaner	Work Shop Flamable Liquids Cabinet					
Mr Muscle	Draino Crystals	Kitchen	No	Yes	Corrosive 8	500Gm/tin X 2	Cleaning the drains
MSA	Lens Cleaner	Camp/Office	No	Yes	Flammable Gas 2	150Gm/tin X 4	Cleaning the lenses on safety glasses
No val	Foam fabric degreaser	Work Shop Flamable Liquids Cabinet					
Ormonoid	brushable waterproofer	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3	4 Lt tin	
Pascoes	Mechanix Caustic Soda	Work Shop Flamable Liquids Cabinet	No	Yes	Corrosive 8	500Gm/tin X 2	Drain cleaning
Pascoes	Drain Clean Crystals	Kitchen	No	Yes	Corrosive 8	500Gm/tin X 2	Cleaning the drains
PeaBeu	Insect spray	Work Shop Flamable Liquids Cabinet					
Plumb Tech	PVC pipe cement Green Type P	Work Shop Flamable Liquids Cabinet	No	Yes	Flammable Liquid 3	500Ml/tin X 2	PVC pipe fabrication/repairs workshop and field
Pool resources	Hydrochloric acid 3200	Work Shop Flamable Liquids Cabinet					
ProChef CANOLA	Cooking Oil spray	Kitchen	No	Yes	Flammable Gas 2	400Gm/tin X 12	Cooking oil spray
PSA Products	Life Saver Smoke Detector Tester	Camp/Office/wshop	No	Yes	Flammable Gas 2	100Gm/tin X 6	Testing Smoke Detectors
Rocol	Easy Line Paint	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1950 Flammable Liquid 3	750Ml/tin X 2	Line marking
Selleys	BBQ Tough Clean	Kitchen	No	Yes	Flammable Gas 2	400Gm/tin X 12	Cleaning the BBQ plate
Selleys No More Gaps	Expanding Foam	Work Shop Flamable Liquids Cabinet	Yes	Yes	Class 2	570Gm/tin X 5	workshop and field
Septone	Rust Converter	W/shop Flammable Liquids cabinet	Yes	Yes	Corrosive 8 phosphoric acid/UN1802	500 ml tin	
SICI18140A	Corrosion/scale inhibitor	W/shop Flammable Liquids cabinet	Yes	Yes	3Z		
Speakman	Eye wash preservative	Work Shop Flamable Liquids Cabinet	Yes	No		500ml	Eye wash stations
Sure Chem	Ardrox 800/3 Black Magnetic Ink	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3	300G tin X2	
Sure Chem	ARDROX 8901W White lacquer	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3	300G tin	
Thorley Laboratories	RID Tropical Strength Repellent	Camp/Office	No	Yes	Flammable Gas 2	150Gm/tin X 12	Mosquito and Fly repellent
Tonizone/Pacific Products	Spray Starch	Camp/Office	No	Yes	Flammable Gas 2	400Gm/tin X 12	Clothing starch
Toyota	Super long life coolant	Work Shop Flamable Liquids Cabinet					
Trefolex	Cutting compound	Work Shop Flamable Liquids Cabinet					
Turco	Pre-check LF solvent cleaner	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1950 Class 2.1	250Gm/tin X 2	NDT testing in workshop and field

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Product Name	Substance Name	Storage location	Hazardous Goods (Yes / No)	Dangerous Goods (Yes / No)	Class & Packaging group	Quantity	Comment
Turco	DY-Check Developer	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1950 Class 2.1	250Gm/tin X 2	NDT testing in workshop and field
Turco	Oy chec remover	Work Shop Flamable Liquids Cabinet					
Turco	No 2	Work Shop Flamable Liquids Cabinet					
Unleaded fuel	Gasoline	Bunded Storage cabinet	No	Yes	Class 3 PackG II 3YE	< 5 lts	Refueling plant & equipment
Valvoline	Chain & cutter bar lubricant	Work Shop Flamable Liquids Cabinet					
Wattmaster	Cable pulling lubricant	Work Shop Flamable Liquids Cabinet					
Wattyl	Killrust thinner for gold paint	W/shop Flammable Liquids cabinet	Yes	Yes	Flammable Liquids 3/UN1263	1 Lt tin	
Wattyl Kill Rust	Epoxy Gloss Enamel Paint	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1950 Flammable Liquid 2	750Ml/tin X 2	Painting
WD-40	Lubricant	Work Shop Flamable Liquids Cabinet	Yes	No		4 Lt	Lubricating parts
White Knight	Rust guard Epoxy Enamel	Work Shop Flamable Liquids Cabinet	No	Yes	UN 1950 Flammable Liquid 2	310Gm/tin X 10	Painting