PBE OPERATIONS

JINGEMIA PRODUCTION FACILITY

ENVIRONMENT PLAN SUMMARY

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Appendix A - Chemical Disclosure

Abbreviations

Term	Definition
ABN	Australian Business Number
ALARP	As low as reasonably practicable
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety (formerly Department of Mines, Industry Regulation and Safety (DMIRS))
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EP	Environment Plan
FY	Financial Year
GDE	Groundwater Dependent Ecosystem
IBC	Intermediate Bulk Container
JPF	Jingemia Production Facility
J09	Jingemia-09
JSA	Job Safety Analysis
MEPAU	Mitsui Exploration and Production Australia
NGERS	National Greenhouse and Energy Reporting Scheme
NORM	Naturally Occurring Radioactive Material
NVCP	Native Vegetation Clearing Permit
OSCP	Oil Spill Contingency Plan
PBE	Perth Basin Energy Operations Ptd Ltd
PGER(E)R	*Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*
RO	Reverse Osmosis
TDS	Total Dissolved Solids
UCL	Unallocated Crown Land
WIA	Well Intervention Activities
YSRC	Yamatji Southern Regional Council

1.0 Introduction

1.1 Overview

PBE Operations Pty Ltd (PBE) are the owner of the Jingemia Production Facility (JPF, the Facility). The Facility comprises of infrastructure contained within Production Licence L14 and the Jingemia well and lease area associated with Jingemia-09 in the MEPAU operated Production Licence L2. The JPF is located 340 kilometres north of Perth in the Shire of Irwin (Figure 1-1).

The JPF is under care & maintenance and plans to recommence operations in 2024/25 FY.

1.2 Purpose

The EP and this EP Summary have been prepared to meet the requirements of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* (PGER(E)R).

The EP has been prepared in accordance with the DMIRS *'Draft Guideline for the Development of Petroleum and Geothermal Environment Plans in Western Australia'* (DMIRS 2021).

1.3 Instrument Holder and Nominated Operator

PBE is the 100% owner and nominated operator of L14. In accordance with the PGER(E)R, the contact details for the operator are listed below (Table 1-1).

Table 1-1: Nominated Contact Details

Company Name	PBE Operations Pty Ltd
ABN	17 612 244 827
Business Address	210 Alice Street, Brisbane QLD 4000
Telephone Number	+61 467 456 043
website	perthbasinenergy.com
Contact Person	Executive Director Energy

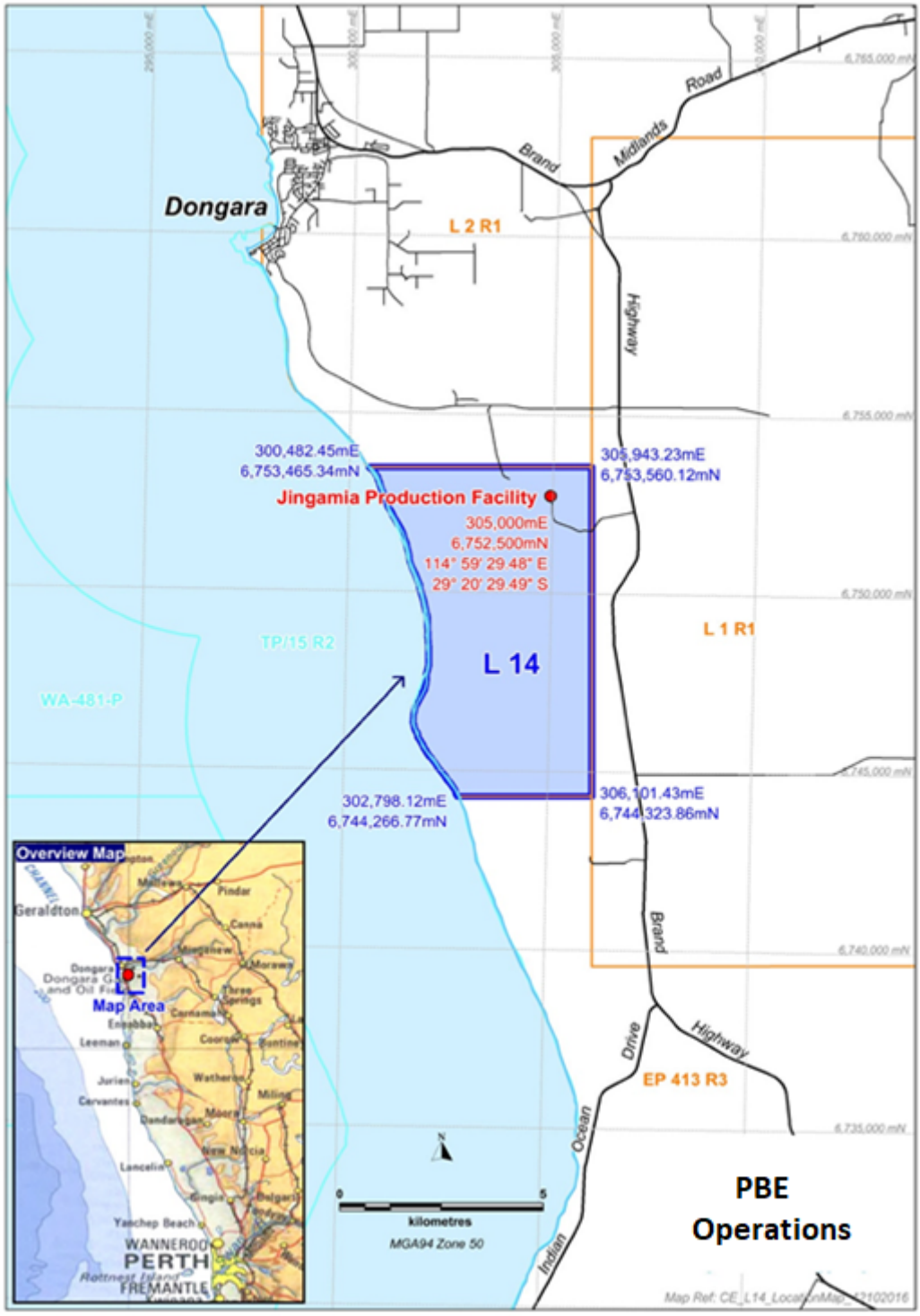

Figure 1-1: JPF Location

2.0 JPF Activities & Infrastructure

2.1 Facility overview

JPF activities predominantly occur on one large facility pad which includes 6 wells connected and a remote reinjection wellpad (J09).

The areas are surfaced and maintained free of vegetation.

Activities pursuant to the production of oil and associated gas and water will occur during this phase of the life of the JPF.

Specifically, the activities associated with this Plan include:

- Production operation of the JPF;
- Inspection, maintenance and repair of infrastructure within the JPF;
- Planned major maintenance including well intervention and workover activities; and
- Intermittent Care & Maintenance.

2.2 Operation of the JPF

Production operations of the JPF involve:

- production of reservoir fluids;
- separation and treatment of reservoir fluids (crude oil, water and gas);
- storage and export of crude oil;
- injection of chemicals;
- re-injection of produced water / groundwater; and
- operations of flare to combust excess gas and venting.

Reservoir fluids which comprise crude oil, water and gas are produced via production wells on artificial lift. Reservoir fluids are separated into the three components where crude oil is transported via infield flowlines to one of several export tanks. Once full, crude is transferred to a load out facility where export tankers are filled with crude oil, then transported offsite for further refining.

Gas is conditioned on-site and used as fuel gas to offset the use of diesel / crude. Where excess gas is generated, it is diverted to a flare tower where it is flared.

Produced water is treated and stored in onsite tanks. It is transferred from the water storage tanks to HPS water injection pumps. These pumps boost the water pressure which is then is directed down one or more of the water injection wells into the production reservoir to provide hydrocarbon sweep and pressure support. All produced water ends up back in the aquifer where it originated.

JPF Process overview schematic overview is shown in Figure 2-1.

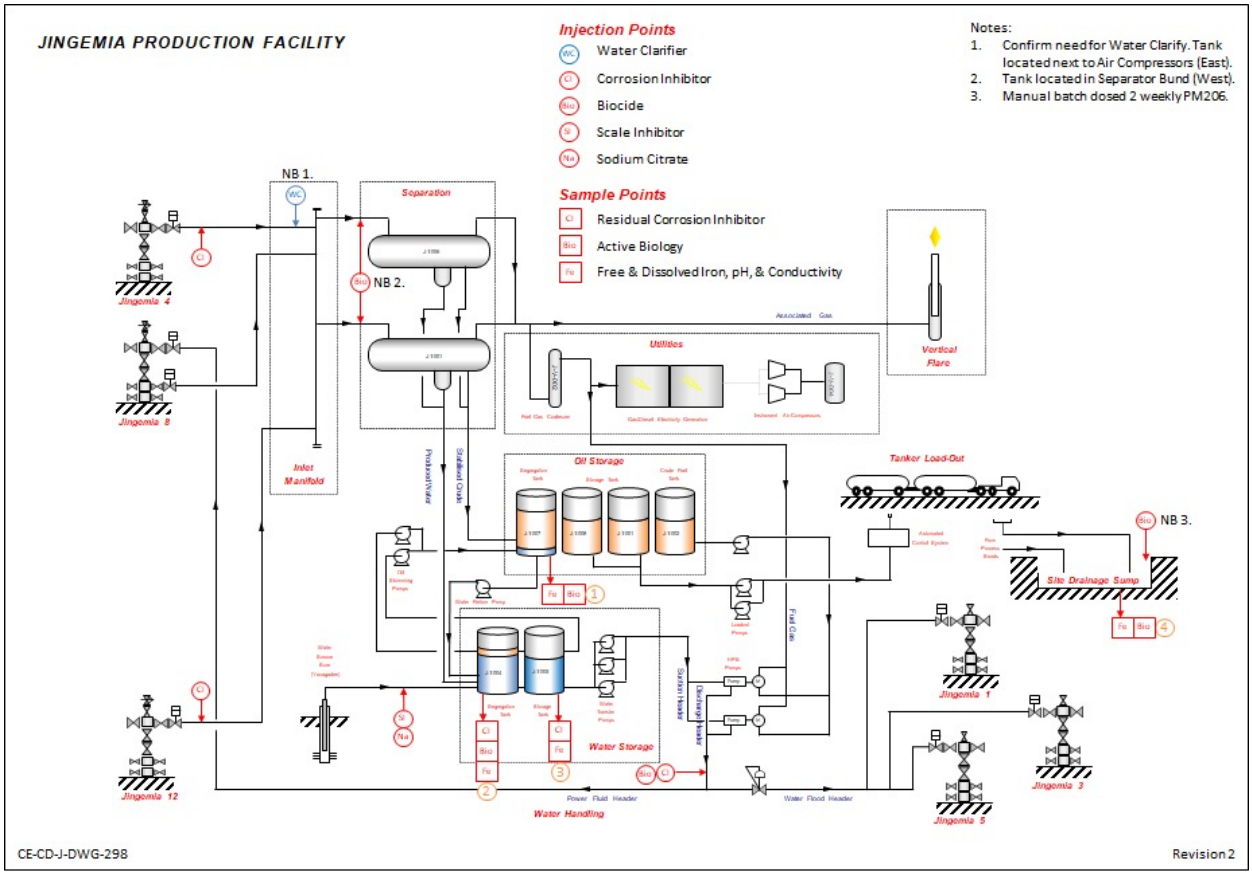

Figure 2-1: JPF Process Schematic

2.3 Inspection, maintenance, and repair of infrastructure within the JPF

Inspection, maintenance and repair of infrastructure within the JPF is undertaken as required but is a continuous activity to ensure that the JPF is operating both safely and at optimum efficiency. Specifically, the types of activities classified as inspection maintenance and repair include:

- routine wellhead maintenance and monitoring;
- well intervention and workover activities;
- periodic maintenance to plant and equipment, as per statutory requirements and scheduling in the maintenance Management System;
- repair and maintenance as required to plant, equipment, hardstands and roads etc.;
- firebreak and vegetation maintenance in accordance with conditions of DFES approval and Shire of Irwin requirements;
- laydown of equipment on designated areas including area subject to NVCP CPS 9098;
- maintenance as required of site buildings; and
- compliance monitoring and maintenance.

2.4 Well Intervention Activities

Well workovers and interventions may be required from time to time to ensure optimal and safe operation of the wells. Well intervention activities are generally defined as activities that occur within the wellbore. These activities include:

- slickline / wireline operations;
- well testing and flowback; and
- well workovers.

2.5 Support operations within the JPF

To support the actual production of crude oil at the JPF, of the following support activities are also required to take place:

- production and combusting produced (associated) gas in power generation and pump engines;
- combusting produced crude in pump engines;
- injection of chemicals in various locations in the facilities, including but limited to: biocide, scale inhibitor, corrosion inhibitor, demulsifier and water clarifier;
- laboratory monitoring of crude and water;
- movement and storage of lubricants and chemicals;
- movement of vehicles and machinery around the facility;
- storage and monitoring of NORM and maintenance to the NORM storage area;
- spraying of herbicide for weed control into the JPF boundary;
- refuelling diesel site vehicles;
- importing / loading in diesel to the bulk diesel storage tank;
- refilling the elevated diesel storage tank; and
- discharging of waste RO fluid into Turkeys Nest.

2.6 Care & Maintenance

The following activities are carried out to ensure JPF integrity and HES Compliance:

- Production operations - No production operations as per section 2.2 are planned during care and maintenance.
- Inspection, maintenance, and repair – Activities in section 2.3 have been reviewed and risk assessed. Where required to ensure HES management or for regulator compliance, activities are continued as set out in the MEX Maintenance and MyOSH Compliance Register. Refer to MOC-096 Care & Maintenance of JPF and JPF Maintenance Policies Risk Assessment (CE-CD-J-PLN-671).
- Well Intervention Activities – All well intervention activies at per section 2.4 may be carried out to manage well integrity or in preparation for production restart. Well testing and flowback, if required, would not be done to the JPF facility. All well intervention activities are detailed in the current Well Management Plans or require a separate well activity plan to be submitted to DEMIRS.
- Support operations within the JPF – Support activities are still requred as per section 2.5 but at a reduced frequency.

2.7 Decommissioning, Reinstatement and Rehabilitation

PBE commit to remove all property, equipment and infrastructure when decommissioning the JPF.

The entire JPF plus all ancillary infrastructure will be removed. The site will be decommissioned to pre existing land use. Decommissioning activities will include the following:

- Risk assessment, Job Safety Analysis (JSA), tool box meetings,
- De-energising of all equipment, mechanical, electrical and receivers,
- Draining or decanting of stored hydrocarbons to approved depository,
- Pigging of all hydrocarbon pipework,
- Draining of all fluids from tanks and other storage containers,
- Removing air, water, gas, foam, and crude pipework,
- Decommission and remove generators,
- Decommission all pumps and remove,
- Decommission, and deconstruct all sheds, lean-to and other structures,
- Decommission and dismantle offices, ablution, and accommodation units.
- Remove fencing,
- Remove any remaining NORMS,
- Rip and windrow bitumen pick up same and put through concrete plant, and
- Scarify and contour plant site.

The JPF is on Unallocated Crown Land (UCL) which was historically cleared and semi-recolonised by disturbance colonising native vegetation. The post activity land use is the cleared area left in a state that will allow surrounding native vegetation recolonising.

The acess track is on private pastoral land and will be left in the state as per the landowner agreement.

3.0 Existing Environment

A summary of the environment within proximity of the proposed activities is included in Table 3-1.

Table 3-1: Existing Environment Summary

Environment	Summary
Landform	The well site is located within the coastal sandhills of the Mid West region of WA within the Lesueur Sandplain subregion of the Geraldton Sandplains Bioregion. The facility area is surrounded by historically disturbed and semi-recolonised native vegetation.
Soil	Unconsolidated sand (quartz grains) and shell fragments with organic matter darkening the surface layers.
Surface Water	No drainage lines, creeks, rivers or wetlands in thew vicinity of JPF. The closest rivers to the JPF are the Irwin River (8 km) and the Arrowsmith River (24 km).
Groundwater	Superficial aquifer present at JPF with TDS in range of 3,000 to 7,000 mg/L. The main regional aquifer underlying the Development Envelope is the Yarragadee. The formation is multi-layered with groundwater occurring within beds of fine to course-grained sandstone confined between thick sequences of shale and siltstone.
Conservation Areas	The JPF is not located within any conservation significant areas ot environmentally sensitive areas.
Vegetation	Clearing Permit CPS 9098 in place for laydown clearing of native vegetation activities. The vegetation immediately surrounding JPF is: • Not identified as having a high potential for GDE. • Not identified as a threatened ecological community • Identified as a priority ecological community • Not identified as containing threatened or priority flora
Weeds	Four weeds of potential concern have been recorded in the area surrounding the JPF.
Dieback	Dieback has not been recorded within the Development Envelope. Environmental conditions such as low rainfall, sandy calcareous soils which provide good water drainage and unsuitable pH reduces the risk of dieback infestation at JPF.
Fauna	There are 37 significant fauna species identified as having the potential to be present within the area surrounding the JPF.
Aboriginal Heritage	There are no registered or lodged aboriginal sites within Production Licence L14 Petroleum.
Socio-economic	The Development Envelope is located in an agricultural dominated area with extensive existing oil and gas field development. It is located within the Shire of Irwin, with the town of Dongara-Port Denison the largest population centre in the vicinity of the JPF.

4.0 Environmental Risk Assessment Methodology

The risk assessment for this Plan was undertaken in accordance with PBE HAZID Identification and Risk Management Procedure (CE-CD-J-PDR-035.0) using the PBE Risk Matrix. This approach generally aligns with the processes outlined in ISO 31000:2009 Risk Management – Principles and Guidelines (Standards Australia/Standards New Zealand 2009) and Handbook 203:2012 Managing Environment-related Risk (Standards Australia/Standards New Zealand 2012). Hazards and aspects and their associated management and mitigation measures are detailed below in Table 4 1.

Table 4-1: Environmental Risks, Management and Mitigation Measures

Aspect	Hazard	Management and Mitigation Measures
Physical Interaction – Soil and Vegetation	• spread non-indigenous species (weed / pathogens) • disturbance to vegetation • damage heritage sites / artefacts	• Weed presence monitoring. • Annual weed control program • Fill material bought onto site is low weed risk • Hygiene for all earth-moving machinery prior to and leaving the area of clearing • Machines and vehicles confined to permitted areas • Environmental specialist Malleefowl inspection • Heritage monitors. • YSRC Heritage Site Discovery Procedure • MyOSH • Monthly monitoring for site erosion • PTW records • Induction
Noise Emissions	• Reduction in ambient noise levels caused by JPF operations (fauna) • Reduction in ambient noise levels caused by JPF operations (stakeholders)	• Noise monitoring (where there is a change to routine operations) • Stakeholder consultation • MYOSH
Light Emissions	• Behavioural disturbance of fauna • Disturbance to relevant stakeholders	• Stakeholder consultation • MYOSH
Atmospheric Emissions	• Reduction in air quality from emissions from JPF operations	• DEMIRS quarterly emissions and discharges report • Annual DWER report • NGERS report • MYOSH.
Extraction of Groundwater	• Drawdown of superficial aquifer	• Current groundwater licences GWL202619 and GWL202801 • Meters are installed and calibrated in accordance with the Facility 5C licence • Annual water abstraction reported
Planned Discharge	• Contamination of Soil and Water causing adverse effects on native vegetation and wildlife	• Downhole chemical disclosure • Chemical acquisition checklist (CE-CD-J-REG-064) completed prior to acquisition of chemicals • Monthly chemical inventory • 6-monthly produced water samples • Annual DWER report • DEMIRS quarterly emissions and discharges report

Aspect	Hazard	Management and Mitigation Measures
		• Quarterly groundwater bore sampling
Physical Interaction - Fauna	• Fauna injury / death	• Ring lock fencing with critter mesh surrounding the turkey nest with fauna egress ladder • Good condition well cellar covers in place • No fauna within cellars • Speed limit signs in place • Induction
Fire	• Habitat and vegetation loss, fauna mortality and contamination	• Hot works permits. • Bushfires Act 1954 25A exemption in place prior to the restricted and prohibited period • Firebreaks maintained • Fire suppression system maintained • Annual fire emergency training exercise
Accidental Release of Solid Waste	• Pollution resulting in attraction and / or injury of protected fauna species within the vicinity of the JPF	• Waste segregation • Lids or covers for receptacles containing potentially windblown waste • Waste register • Appropriately licenced waste contractors • Disposal at licenced waste facility • Induction
Accidental Release – Small release of reservoir fluids, produced water, hydrocarbon or hazardous materials	• Contamination of soil / groundwater.	• Secondary containment for hazardous liquids • Production chemical IBC's (or drums) stored within bunded areas and use dedicated transfer hose • NORMS storage containers are closed, secured and bunded • PBE Well Integrity Register • PBE waste register • WIA integrity and securement checks • Recordable incident reports • Spill protection • Incident reports • Daily field readings. • EP awareness • Spill kits are in place and maintained. • Induction
Accidental Release– Hydrocarbon Spill During Bulk Transfer / Storage	• Contamination of soil / groundwater. • Contamination and subsequent toxic effects to vegetation.	• Bulk transfer procedures • Well maintained export facility • MEX maintenance system • Closed drainage system on export facility • Overfill / overpressure protection on bulk crude export tankers. • High-high level alarm on bulk crude storage tanks • Oil level monitoring (manned or unmanned plant) • Daily checks • Tank certification • AS1940 [2004] tank bunding • Bunds are maintained empty, and valves closed. • OSCP (CE-CD-J-PLN-020) • Groundwater monitoring • Spill kits in place and maintained • Induction

Aspect	Hazard	Management and Mitigation Measures
Accidental Release– Traffic accident (within the JPF) resulting in a release from bulk tanker	• Contamination of soil / groundwater. • Contamination and subsequent toxic effects to vegetation.	• Speed limit signs • Induction • OSCP (CE-CD-J-PLN-020) • Groundwater monitoring. • Spill kits
Accidental Release– LOWC	• Contamination of soil / groundwater. • Contamination and subsequent toxic effects to vegetation.	• HES audit • Pressure control equipment. • Pressure test prior to well entry • WSM well control certification records • OSCP (CE-CD-J-PLN-020) • Groundwater monitoring • Spill kits • Induction

5.0 Implementation Strategy

The objective of the implementation strategy is to describe how all aspects of the activity will be directed, reviewed and managed to ensure that all potential impacts and risks are continuously reduced to ALARP. The specific implementation objectives include:

1. Ensure that the agreed environmental performance objectives and standards are met
2. Identify specific systems, practices and procedures to be used to ensure that environmental risks and effects are reduced to ALARP
3. Establish a commitment to the protection of the environment
4. Establish a clear chain of command that sets out the roles and responsibilities of personnel in relation to the implementation, management and review of the EP
5. Ensure that each employee or contractor working on or in connection with the activity has the appropriate skills and training
6. Monitor, audit and review environmental performance and the Implementation Strategy
7. Maintain quantitative records
8. Develop and implement emergency and spill preparedness planning and response capability
9. Report on environmental performance
10. Provide for appropriate consultation with relevant government authorities and other interested persons or organisations

Details of PBE systems, practices and procedures relating to the management of all potential impacts and risks of the activity are detailed in Table 5-1. The objective of these is to continuously reduce the potential impacts and risks of the activity to ALARP.

Table 5-1: OMS Overview

OMS Principle	OMS components
Leadership & Commitment	• Vision • Values • Strategy and Targets • Policies • Standards • Organisation
Risk Management	• Risk Assessment • Risk Controls • Quality Assurance • Plans, Procedures and Registers • Competency & Training
Project Implementation	• Asset Design • Inspection and Maintenance • Plans, Procedures and Schedules
Continuous Improvement	• Monitoring • Reporting • Learning • Auditing and Corrective Actions

6.0 Stakeholder Consultation

Minimising and mitigating the potential environmental impacts associated with the JPF is assisted by the engagement of key stakeholders to ensure all issues are identified and addressed.

In accordance with Regulation 17 of PGER(E)R, PBE has consulted with the following key stakeholders in relation to its JPF activities:

- government agencies (DEMIRS, DWER, DFES),
- Yamatji Southern Regional Corporation (YSRC),
- Department of Planning, Lands and Heritage (DPLH),
- Shire of Irwin,
- Access Road Landholder, and
- Neighbouring landholder.

Consultation on the JPF well has occurred historically and will be ongoing (Table 6-1).

Table 6-1: Consultation – Current & Ongoing

Stakeholder	Consultation to Date	Ongoing
Access Road Landowner	Consultation on access into Jingemia and management of agricultural activities.	Land access and future land use.
Neighbouring Landholders	Recent letter sent to advise of revision to EP and inviting feedback on JPF activities.	Updates on operational status changes.
DPLH	Contact to discuss completion criteria for JPF site.	Future land use.
DFES	JPF fire readiness and fire breaks.	Fire planning and response.
YSRC	Inquiry on survey and monitoring requirements for JPF additional laydown area.	Engagement of Heritage Monitors for JPF additional laydown area.
DEMIRS	Submission of JPF Environment Plan (Rev 12).	Consultation in relation to the assessment of the Environment Plan and ongoing compliance of activities under the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012

7.0 References

DMIRS, Department of Mines, Industry Regulation and Safety. 2021. Draft Guideline for the Development of Petroleum and Geothermal Environment Plans in Western Australia

DMP, Department of Mines and Petroleum. 2013. “Chemical Disclosure Guideline.” https://www.dmp.wa.gov.au/Documents/Environment/ENV-PEB-178.pdf.

ISO. 2018. “ISO 31000:2018 Risk Management - Guidelines.”

Standards Australia/Standards New Zealand. 2012. “ Handbook 203:2012 Managing Environment-related Risk.” Sydney, Australia/Wellington, New Zealand.

APPENDIX A – Chemical Disclosure

All chemicals that are to be used down hole under this plan are included on the Australian Inventory of Chemical Substances (AICS) or are otherwise approved for use in Australia.

A.1 Production Operations

A.1.1 System Details

A.1.2 Product List

A.1.3 Chemical List

A.1.4 Contingency Products Details

A.1.5 Contingency Chemical List

A.2 Well Intervention Operations

A.2.1 System Details

A.2.2 Product List

A.2.3 Chemical List

A.2.4 Contingency Products Details

A.2.5 Contingency Chemical List

A.1 Production Operations

A.1.1 System Details

System	Total Volume of System
JPF produced water	1280kL water / day (8000bbl water / day)

A.1.2 Product List

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
Produced water	PBE	Water disposal to water injection well	99.9605	No hazard	NA
Sodium Citrate solution	Environex	Water Stabiliser	0.0250	**Acute Toxicity:** no data available **Chronic Toxicity:** Not known as mutagenic, carcinogenic or reproductive toxicant **Ecotoxicity:** Component 1. Sodium Citrate: LD50 655 to 825.9 mg/l Component 2. Citric Acid: Fish LD50 440 to 706 mg/l Invertebrate LD100 Daphnia magna 120 mg/l lifetime exposure in soft water, LD0 Daphnia magna 80 mg/l lifetime exposure in soft water. **Biodegradation and bioaccumulation:** Not available	28 Feb 2023

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
SCAL16157A	ChampionX	Scale Inhibitor	0.0075	**Acute toxicity:** no data available **Chronic Toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC No reproductive toxic effects expected. Contains no ingredient listed as a mutagen **Ecotoxicity:** This product has no known ecotoxicological effects. Daphnia and other aquatic invertebrates LC50(48h) Palaemonetes africanus: 826 mg/l LC50(48h) Desmocaris trispinosa: 78.07 mg/l **Biodegradation and bioaccumulation:** Not available	25 Jun 2025
CORR22363A	ChampionX	Corrosion Inhibitor	0.0020	**Acute toxicity:** Acute Oral Toxicity 1,056 mg/kg Acute inhalation toxicity (vapour) >20 mg/l (4 h) Acute dermal toxicity >2,000 mg/kg **Chronic toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. Suspected of damaging fertility or the unborn child. Contains no ingredient listed as a mutagen **Ecotoxicity:** Toxic to aquatic life with long lasting effects Component 1. - Tall Oil, DETA Imidazoline Acetates Fish LC50 (96hr): >023mg/L Daphnia & other aquatic invertebrates EC50(48h) 0.72 mg/l, Chronic toxicity 0.063 mg/l (21 d) Algae EC50(72hr): 0.17mg/L Bacteria 175 mg/l	07 Sep 2021

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Component 2. 2-Mercaptoethanol Fish LC50(96hr): 37mg/L (Leuciscus idus (Golden orfe) Daphnia & other aquatic invertebrates LC50(48hr): 0.4mg/L (Daphnia magna - Water flea) Algae EC50(72hr) 19 mg/l (Desmodesmus subspicatus - green algae Component 3. Benzyl-Dimethyl-Tetradecyl-Ammonium Chloride Daphnia & other aquatic invertebrates EC50(48h) 0.0058 mg/l Component 4. Diethylenetriamine Fish LC50(96h) 430 mg/l (Poecilia reticulata - guppy) Daphnia & other aquatic invertebratesEC50(48h) 16 mg/l (Daphnia magna - Water flea) Algae EC50(72h) 187 mg/l (Pseudokirchneriella subcapitata - green algae) Bacteria 32.7 mg/l Component 5. Isopropanol Fish LC50/(96h) 9,640 mg/l (Pimephales promelas - fathead minnow) Daphnia & other aquatic invertebrates LC50 > 10,000 mg/l (Daphnia magna - Water flea) Bacteria 1,050 mg/l **Biodegradation and bioaccumulation:** Not available ***The low volume, lack of environmental receptors, storage and handling practices and site security ensure there is no plausible significant risk of health or environmental risks associated with the storage and handling of this product.***	
BIOC31150A	ChampionX	Biocide	0.0050	**Acute toxicity:** Acute oral toxicity 260.87 mg/kg Acute inhalation toxicity 0.5303 mg/l (4 h) dust/mist Acute dermal toxicity > 2,000 mg/kg **Chronic toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. No reproductive toxic effects expected.	02 Jun 2021

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Contains no ingredient listed as a mutagen **Ecotoxicity**: Toxic to aquatic life with long lasting effects Component 1. - Glutaraldehyde Fish LC50(96h) 0.8 mg/l (Oncorhynchus mykiss - rainbow trout) Daphnia & other aquatic invertebrates EC50(48h) 0.35 mg/l (Daphnia magna - Water flea) Algae EC50(72h) 0.6 mg/l (Scenedesmus quadricauda - Green algae), NOEC(72h) 0.025 mg/l Scenedesmus quadricauda - Green algae) Component 2. - Methanol Fish LC50(96h) 15,400 mg/l Daphnia & other aquatic invertebrates EC50(48h) > 10,000 mg/l Algae EC50(72h) 22,000 mg/l Bacteria > 1,000 mg/l **Degradation and bioaccumulative potential:** biodegradation data not available, not expected to bioaccumulate.	
TOTAL			100%		

A.1.3 Chemical List

Chemicals within Products	CAS number	Mass fraction (%)
Water	7732-18-5	99.97841
Glutaraldehyde	111-30-8	0.01500
Methanol	67-56-1	0.00250
Citric Acid	77-92-2	0.00225
Sodium Citrate, Dihydrate	6132-04-3	0.00038

Chemicals within Products	CAS number	Mass fraction (%)
Benzyl-Dimethyl-Dodecyl-Ammonium Chloride	139-07-1	0.00020
Tall Oil, DETA Imidazoline Acetates	68140-11-4	0.00020
2-Mercaptoethanol	60-24-2	0.00020
Benzyl-Dimethyl-Tetradecyl-Ammonium Chloride	139-08-2	0.00060
Isopropanol	67-63-0	0.00006
Benzyl-Dimethyl-Hexadecyl-Ammonium Chloride	122-18-9	0.00020
Diethylenetriamine	111-40-0	0.00001
Total		**100.0000**

A.1.4 Contingency Products Details

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
CORR11447A	ChampionX	Corrosion Inhibitor	0.0020	**Acute toxicity:** Acute oral toxicity > 2,000 mg/kg Acute inhalation toxicity > 20 mg/l (4 h) vapour Acute dermal toxicity > 2,000 mg/kg **Chronic toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. Suspected of damaging fertility or the unborn child. Contains no ingredient listed as a mutagen **Ecotoxicity:** Toxic to aquatic life with long lasting effects Component 1. - Tall Oil, DETA Imidazoline Acetates Fish LC50(96hr): >023mg/L Daphnia & other aquatic invertebrates LC50(48hr): 0.72mg/L Algae EC50(72hr): 0.17mg/L Bacteria 175 mg/l Component 2. 2-Mercaptoethanol Fish LC50(96hr): 37mg/L (Leuciscus idus (Golden orfe) Daphnia & other aquatic invertebrates LC50(48hr): 0.4mg/L (Daphnia magna - Water flea) Algae EC50(72hr) 19 mg/l (Desmodesmus subspicatus - green algae, NOEC(72hr) 1.7 mg/L (Desmodesmus subspicatus - green algae) **Degradation and bioaccumulative potential:** Biodegradation and bioaccumulation not available ***The low volume, lack of environmental receptors, storage and handling practices and site security ensure there is no plausible significant risk of health or environmental risks associated with the storage and handling of this product.***	23 Mar 2021

A.1.5 Contingency Chemical List

Chemicals within Products	CAS number	Mass fraction (%)
Tall Oil, DETA Imidazoline Acetates	68140-11-4	0.00040
2-Mercaptoethanol	60-24-2	0.00030
Benzyl-Dimethyl-Tetradecyl-Ammonium Chloride	139-08-2	0.00030
Benzyl-Dimethyl-Dodecyl-Ammonium Chloride	139-07-1	0.00010

A.2 Well Intervention Operations

A.2.1 System Details

System	Total Volume of System
Well Intervention Operations – Inhibited Brine / Kill Fluid, Loss Circulation Pill & Treatment Fluid	477 kL (3,000bbl) per well per event **Note: Assumption that a workover is required for 1 month with 4 bbl per hour loss rate.**

A.2.2 Product List

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
Water	Groundwater abstraction bore	Make up water	86.105	N/A	N/A
Ancor 1	Newpark	Corrosion Inhibitor	0.996	**Acute toxicity:** LD50 (Ingestion): 2200 mg/kg (rabbit) LD50 (Intraperitoneal): 1450 mg/kg (mouse) LD50 (Skin): > 20 mL/kg (rabbit) TDLo (Ingestion): 16 g/kg/64 weeks (mouse - cancer) Component 1 Triethanolamine: LD50 (oral) 6400 mg/kg (rat) LD50 (dermal) > 2000 mg/kg (rabbit) **Chronic toxicity:** Not classified as a mutagen Triethanolamine is not classifiable as to its carcinogenicity. Not classified as a reproductive toxin. **Ecotoxicity:** LC50 (shrimp): > 100 ppm	16 Dec 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Degradation and bioaccumulative potential: Readily biodegradable, not expected to bioaccumulate	
Idcide-20	Newpark Drilling Fluids	Biocide	0.065	**Acute Toxicity:** Component 1: TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE(2:1) Oral (rat) LD50 248 mg/kg Dermal (rat) LD50 > 2000 mg/kg Inhalation (rat) LC50 5.5 mg/L (4hrs) Oral (rat) TDLo 650 mg/kg (13 weeks) - intermittent **Chronic Toxicity:** Not classified as a mutagen Not classified as a carcinogen Not classified as a reproductive toxin. **Ecotoxicity:** Compound 1: 75% TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE: LC50 (Rainbow Trout) = 119 mg/L (96 hr) LC50(Bluegill Sunfish) = 93 mg/L (96 hr) EC50 (Daphnia Magna) = 19 mg/L (48 hr) LC50 (Brown Shrimp) = 340 mg/L (96 hr) LC50 (Mysid Shrimp) = 9.5 mg/L (96 hr) LC50 (Sheepshead Minnow) = 94 mg/L (96 hr) LC50 (Jevenile Plaice) = 86 mg/L (96 hr) **Degradability and bioaccumulative potential:** This product is readily biodegradable and no information provided on bioaccumulative potential.	16 Dec 2022
Salt	Newpark Drilling Fluids	Chloride Source	12.677	**Acute Toxicity:** Oral (rat) LD50 3000 mg/kg Dermal (rabbit) LD50 > 10000 mg/kg Inhalation (rat) LC50 > 42000 mg/m^3(1 h)	08 Jan 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Chronic Toxicity: No evidence of mutagenic effects. No evidence of carcinogenic effects. No relevant or reliable studies on reproductive toxicity were identified. **Ecotoxicity:** Aquatic (water flea) LC50 = 2122 mg/L (48 h) Aquatic (fathead minnow) LC50 = 6.57 g/L (96 h) **Degradability and bioaccumulative potential:** Biodegradability does not pertain to inorganic substances. Not expected to bioaccumulate.	
Sodium Sulphite	Newpark Drilling Fluids	Reducing Agent	0.157	**Acute Toxicity:** Component 1: Sodium Sulphite: Oral (mouse) LD50 820 mg/kg Oral (rat) LD50 3560 mg/kg Dermal (rat) LD50 > 2000 mg/kg Inhalation(rat) LC50 > 5500 mg/m3 (4h) Component 2: Sodium Sulphate: Oral (mouse) LD50 5989 mg/kg Component 3: Sodium Carbonate: Oral (rat) LD50 >2000 mg/kg Dermal (rat) LD50 > 2000 mg/kg Inhalation(rat) LC50 > 2000 mg/m³ **Chronic Toxicity:** Not classified as a mutagen. Not classified as a carcinogen. Not classified as a reproductive toxin. **Ecotoxicity:** No information provided.	28 Apr 2021

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Degradability and bioaccumulative potential: Biodegradability does not pertain to inorganic substances. This product does not bioaccumulate.	
Total			**100**		

A.2.3 Chemical List

Chemicals within Products	CAS number	Mass fraction (%)
Water	7732-18-5	86.4333
Sodium Chloride	7647-14-5	12.6770
Tetrakis (Hydroxymethyl) Phosphonium Sulphate	55566-30-8	0.0161
Sodium Sulphite	7757-83-7	0.1525
Sodium Sulphate	7757-82-6	0.0039
Sodium Carbonate	497-19-8	0.0002
Triethanolamine	102-71-6	0.7169
Total		**100.0000**

A.2.4 Contingent Product List

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
CRW24340	Baker Hughes	Hydrotest Corrosion Inhibitor	0.366	**Acute toxicity:** not available **Chronic toxicity:** No known significant effects or critical hazards (not a carcinogen, mutagen, reproductive or developmental toxin) **Ecotoxicity:** Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Component 1 Amines, N-tallow alkyltrimethylenedi-, ethoxylated Acute LC50 (Crustaceans – Corophium Volutator) 2723 mg/l Marine water (10 days) Component 2 Quaternary ammonium compounds, benzyl-C12-14-alkyldimethyl, chlorides Algae Acute EC50 0.03 mg/l (96 h) Invertebrates Acute EC50 (Daphnia) 0.016 mg/l (48 h) Fish Acute LC50 0.515 mg/l (96 h) Component 3: 2-(2-butoxyethoxy)ethanol Fish Acute LC50 (Lepomis macrochirus) 1300000 µg/l (96 h) **Degradation and bioaccumulative potential:** Readily biodegradable, low bioaccumulative potential log Pow -1.07	19 Feb 2024
CA370FE	CHAMPIONX	Fluid Iron Control Additive	0.020	**Acute toxicity:** not available **Chronic toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. No toxicity to reproduction Contains no ingredient listed as a mutagen **Ecotoxicity:** This product has no known ecotoxicological effects **Degradation and bioaccumulative potential:** Biodegradation and bioaccumulation not available	19 Jul 2021

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
CF210PH	Condor Energy Services	Fluid Buffer to Resist pH Changes	0.240	**Acute Toxicity:** Health injuries are not known or expected under normal use. **Chronic Toxicity:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. No reproductive toxic effects expected. Contains no ingredient listed as a mutagen **Ecotoxicity:** This product has no known ecotoxicological effects. Component 1 Citric Acid: LC50 (Fish) > 100 mg/l (96 h) **Degradation and bioaccumulative potential:** Biodegradation and bioaccumulative potential not available	22 Jul 2021
Caustic Soda	Newpark Drilling Fluids	Reagent / Scrubbing Agent	0.025	**Acute Toxicity:** Component 1: SODIUM HYDROXIDE (1310-73-2): Oral (rabbit) LDLo 500 mg/kg Intraperitoneal (mouse) LD50 40 mg/kg Ingestion (human) LDLo 1.57 mg/kg **Chronic Toxicity:** Both the in vitro and the in vivo genetic toxicity tests indicated no evidence of mutagenic activity. Not classified as a carcinogen. Not classified as a reproductive toxin. **Ecotoxicity:** EC50 Ceriodaphnia: 40 mg/L. LC50 values ranged between 33 and 189 mg/L. **Degradability and bioaccumulative potential:** Readily biodegradable. Does not bioaccumulate.	16 Dec 2022
Circal (Calcium Carbonate)	Newpark Drilling Fluids	Fluid Weight (Density) Modifier	0.359	**Acute Toxicity:** This product is expected to be of low toxicity. Based on available data, the classification criteria are not met. LD50 (Ingestion) = 6450 mg/kg (rat).	14 Dec 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Component 1: Calcium Carbonate Oral (rat) LD50 >2,000 mg/kg Dermal (rat) LD50 >2,000 mg/kg Inhalation LC50 >3.0 mg/L **Chronic Toxicity:** Not classified as a mutagen Not classified as a carcinogen. Crystalline silica is classified as carcinogenic to humans (IARC Group 1). Not classified as a reproductive toxin. **Ecotoxicity:** Calcium carbonate occurs naturally in a wide variety of substances including limestone, marble and egg shells. It is not anticipated to cause adverse environmental effects. **Degradability and bioaccumulative potential:** Dissolved calcium carbonate dissociates into calcium and carbonate ions. Calcium ions will be assimilated by living organisms in the water and the carbonate will become part of the carbon cycle. This product does not bioaccumulate.	
NDFT 376/377	Newpark Drilling Fluids	Fluid loss control additive	0.425	**Acute Toxicity:** Unknown acute toxicity **Chronic Toxicity:** No information available on mutagenicity. No information available on carcinogenicity. No information available on reproductive toxicity. **Ecotoxicity:** The environmental impact of this product has not been fully investigated. **Degradability and bioaccumulative potential:** No information available on degradability or bioaccumulative potential.	14 Dec 2022
Newzan D	Newpark Drilling Fluids	Fluid Viscosity Modifier	0.029	**Acute Toxicity:** This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated. **Chronic Toxicity:** No evidence of mutagenic effects. No evidence of carcinogenic effects. No relevant or reliable studies were identified on reproductive toxicity.	08 Jan 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
				Ecotoxicity: No information provided. **Degradability and bioaccumulative potential:** No information provided on degradability or bioaccumulative potential.	
Potassium Chloride	Newpark Drilling Fluids	Fluid Weight (Density) Modifier	13.709	**Acute Toxicity:** Oral (rat) LD50 2,600 mg/kg **Chronic Toxicity:** No evidence of mutagenic effects. No evidence of carcinogenic effects. No relevant or reliable studies were identified on reproductive toxicity. **Ecotoxicity:** KCl is not hazardous to freshwater organisms. LC50 (Ictalurus punctulus) = 720 mg/l (48h) LC50 (Daphnia magna) = 177 mg/l (48h) EC50 (Nitzschia linearis) = 1337 mg/l (120h). **Degradability and bioaccumulative potential:** Biodegradability does not pertain to inorganic substances. Does not bioaccumulate.	14 Dec 2022
Quickseal (F,M,C)	Newpark Drilling Fluids	Fluid loss control additive	0..432	**Acute Toxicity:** This product is expected to be of low acute toxicity. Oral (rat) LD50 > 5000 mg/kg. Dermal (rat) LD50 > 2000 mg/kg Inhalation (rat) LC50 = 5800 mg/m3 (4hrs) **Chronic Toxicity:** No evidence of mutagenic effects. No evidence of carcinogenic effects. No relevant or reliable studies were identified on reproductive toxicity. **Ecotoxicity:** Low toxicity to aquatic organisms. **Degradability and bioaccumulative potential:** This product is readily biodegradable. This product is not expected to bioaccumulate.	14 Dec 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
Soda Ash or Sodium Carbonate (Na2CO3),	Newpark Drilling Fluids	Fluid pH Control (increase)	0.050	**Acute Toxicity:** Component 1: Sodium Carbonate Oral (rat) LD50 > 2000 mg/kg Dermal (rat) LD50 > 2000 mg/kg Inhalation (rat) LC50> 2000 mg/m³ **Chronic Toxicity:** Not classified as a mutagen. Not classified as a carcinogen. Not classified as a reproductive toxin. **Ecotoxicity:** Fish (Lepomis macrochirus) LC50 = 300 mg/l (96 h) Crustaceans (Ceriodaphnia dubia) EC50 = 200 - 227 mg/l (48 h) **Degradability and bioaccumulative potential:** Not applicable for inorganic substances. Not expected to bioaccumulate.	16 Dec 2022

Product Name	Supplier	Purpose	Volume in System (%)	Toxicity and Ecotoxicity	SDS
Hydrochloric Acid	Telford	Fluid pH Control (decrease)	0.013	**Acute toxicity:** Component 1 Hydrochloric Acid: Inhalation (rat) LC50: 3124 ppm/1hr[2] Oral (rat) LD50: 900 mg/kg[2] Irritation Eye (rabbit): 5mg/30s - mild Component 2 Titanium Oral (rat) LD50: >2000 mg/kg[1 **Chronic toxicity:** data not available **Ecotoxicity:** Component 1 Hydrochloric Acid: Fish LC50 70.057mg/L (96 h) Fish EC50 0.014000mg/L (9.33 h) Fish NOEC 10mg/L (0.08 h) Algae or other aquatic plants EC50 344.947mg/L (96 h) Component 2 TTitanium Algae or other aquatic plants EC50 >100mg/L (4.5 h) Crustacean NOEC 1mg/L (48 h) **Degradation and bioaccumulative potential:** Biodegradation not available and bioaccumulation potential low Log KOW 0.5392	31 May 2022

A.2.5 Contingency Chemical List

Chemicals within Products	CAS number	Mass fraction (%)
Potassium Chloride	7447-40-7	13.7129

Chemicals within Products	CAS number	Mass fraction (%)
Sodium Hydroxide	1310-73-2	0.0254
2-(2-butoxyethoxy)ethanol	112-34-5	0.1098
Amines, N-tallow alkyltrimethylenedi-, ethoxylated	61790-85-0	0.1098
cyclohexylamine	108-91-8	0.0366
Organic Fibre(s)	9004-34-6	0.4248
Cellulose	9004-34-6	0.4317
Quartz (Silica Crystalline)	14808-60-7	0.0036
Calcium Carbonate	471-34-1	0.3551
Polyacrylic Polymer	9003-01-4	0.0000
1,2,4-Trimethylbenzene	95-63-6	0.0027
Cinnamaldehyde	104-55-2	0.0700
Citric Acid	77-92-9	0.1440
Formic Acid	64-18-6	0.1500
Heavy Aromatic Naphtha	64742-94-5	0.0020
Isopropanol	67-63-0	0.0200
Methanol	67-56-1	0.0020
Naphthalene	91-20-3	0.0027
N-Benzyl-Alkylpyridinium Chloride	68909-18-2	0.0020
Hydrochloric Acid	7647-01-0	0.0033
Sodium carbonate anhydrous	497-19-8	0.0500
Sodium erythorbate	6381-77-7	0.0200
Tar Bases, Quinoline Derivatives, Benzyl Chloride-Quat	72480-70-7	0.0700