Chevron

human energy®

Gorgon Project

Carbon Dioxide Injection System Pipeline and Wells Operations Environment Management Plan: Summary

Document ID:	**ABU161100705**
Revision ID:	**3.6**
Revision Date:	**30 June 2023**
Next Revision Due:	**TBD**
Information Sensitivity:	**Public**

Gorgon Project
Carbon Dioxide Injection System Pipeline and Wells Operations Environment Management Plan: Summary

Contents

Tables

Figures

Appendix A

Chemical Disclosure

1.0 Introduction

1.1 Overview

Chevron Australia Pty Ltd (CAPL) is the operator for the Gorgon Gas Development (also known as the Gorgon Project) on behalf of the Gorgon Joint Venture (GJV). Offshore production wells and pipeline infrastructure associated with the Jansz–Io and Gorgon gas fields gathers and transports gas to the Gorgon Gas Treatment Plant (GGTP) on Barrow Island, where it is processed.

Carbon dioxide (CO_2), which occurs naturally in the feed gas, is separated during the production process and injected in a supercritical state into deep rock formations below Barrow Island. The operation of CO_2 infrastructure has been evaluated as having low environmental impact or risks.

1.2 Location

The CO_2 Pipeline and Wells are located on Barrow Island within the PL 93 Licence Area (Figure 1-1). The CO_2 Pipeline runs north from the GGTP on the eastern side of Barrow Island for approximately 7.3 km along the pipeline right-of-way (ROW), connecting to CO_2 Injection Drill Centres (DC-A, DC-B, and DC-C). Pressure Management Drill Centres (DC-D and DC-E) are located more than 4 km west of the CO_2 Pipeline and the Injection Drill Centres.

Detailed information regarding the location and layout of the infrastructure associated with this Plan is included in Section 2.1.

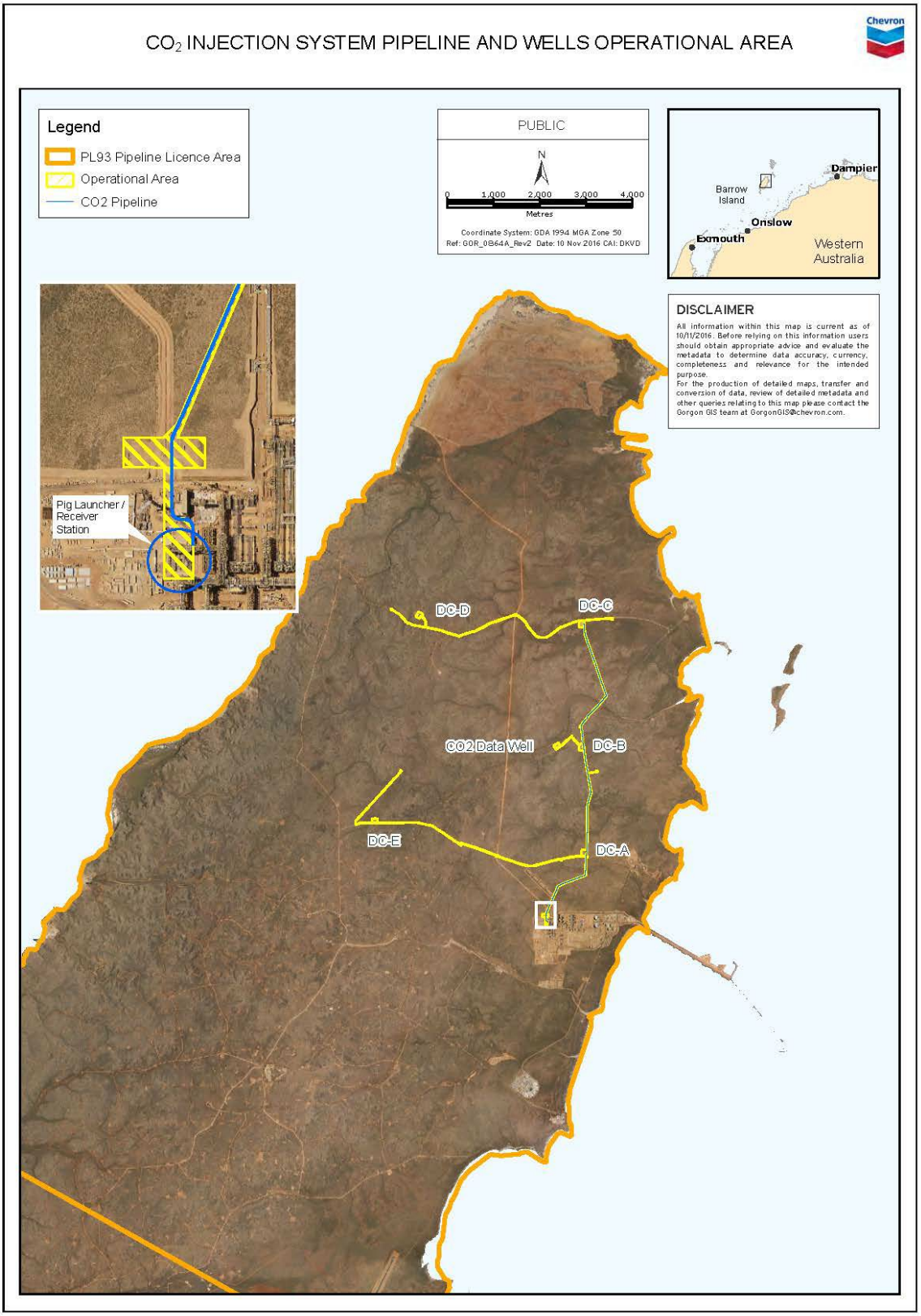


Figure 1-1: CO_2 Pipeline and Wells Operational Area

1.3 Scope

The PL 93 Licence Area (Figure 1-1) encompasses much of Barrow Island, identified at the licence application stage to allow for the potential development and expansion of the CO_2 Injection System. The scope of the Environment Management Plan (EMP) is limited to the activity as summarised in Section 2.0.

1.4 Licence Holder and Operator Details

Chevron Australia Pty Ltd is nominated as the operator on behalf of the GJV title holders (Table 1-1) for Pipeline Licence PL 93, granted under the *Petroleum Pipelines Act 1969* (WA).

Table 1-1: Titleholder Details

Titles	Details	Titleholders	Operator	Address
PL 93	CO_2 Injection System Pipeline Licence Onshore	• Chevron Australia Pty Ltd • Shell Australia Pty Ltd • Mobil Australia Resources Company Pty Ltd • Tokyo Gas Gorgon Pty Ltd • Osaka Gas Gorgon Pty Ltd • JERA Gorgon Pty Ltd	Chevron Australia Pty Ltd	QV1, 250 St Georges Terrace, Perth, WA, 6000

In accordance with the Petroleum Pipelines (Environment) Regulations 2012, contact details for the operator, CAPL, are listed in Table 1-2.

Table 1-2: Operator Contact Details

Company Name	Chevron Australia Pty Ltd
Nominated Liaison Person	Kate Yates/Melissa Smith
Position	Operations Manager/Corporate Affairs Operations Manager
Business Address	GPO Box S1580, Perth WA 6845
Telephone Number	08 9413 6764/08 9216 4000 (public contact number)
Email Address	ABUEnvPlanInfo@chevron.com

1.5 Stakeholder Engagement

Regular consultation with relevant stakeholders has been undertaken by CAPL throughout the development of the environmental impact assessment management documentation for the Gorgon Gas Development and Jansz Feed Gas Project and in the development of this EMP.

Stakeholder consultation has included engagement with the community, government departments, industry operators and contractors to CAPL via planning workshops, risk assessments, meetings, teleconferences, and the formal environmental approval processes.

1.5.1 Stakeholder Identification

In accordance with Regulation 17 of the Petroleum Pipelines (Environment) Regulations 2012, CAPL completed a scoping exercise to determine which authorities, persons, and organisations were considered to be relevant.

No permanent population resides on Barrow Island. Barrow Island has been actively used for petroleum exploration and production purposes since 1957 and access to Barrow Island

is restricted to personnel associated with oilfield operations, Western Australian Department of Biodiversity Conservation and Attractions staff, and Gorgon Gas Development and Jansz Feed Gas Pipeline staff. Therefore, the relevant stakeholders associated with the operation of the CO_2 Injection System Pipeline and Wells were identified as:

- Department of Biodiversity, Conservation and Attractions (DBCA) (State)
- Department of Water and Environmental Regulation (DWER) (State)
- Department of Jobs, Tourism, Science and Innovation (DJTSI) (State)
- Department of Agriculture, Water and the Environment (DAWE) (Commonwealth).

1.5.2 Stakeholder Log

Table 1-3 summarises the consultation undertaken specific to this Plan.

Table 1-3: Consultation Summary

Stakeholder	Date	Summary of Consultation	Objections / Claims Raised	CAPL Response
DBCA	14 February 2022	Email informing DBCA that the EP is being revised and CAPL is seeking feedback from relevant stakeholders.	N/A	N/A
	24 February 2022	Meeting with DBCA to discuss the 5-year revision on the EP. CAPL presented on the key changes to the EP. DBCA did not have any questions on the EP.	No objections or claims were raised.	CAPL will continue to keep DBCA informed on updates relevant to the Gorgon Gas Development.
	28 February 2022	Email from DBCA requesting a copy of the revised EP.	No objections or claims were raised.	CAPL provided DBCA a copy of the EP as requested.
	17 March 2022	Email from DBCA providing feedback on Revision 4.2 of the EMP.	DBCA provided advice /requested clarification on the following aspects: • Fire management • Lighting • Fauna • Unplanned releases • Waste management	CAPL provided responses to all of DBCA's feedback and updated relevant sections of the EMP. CAPL has offered to discuss further with DBCA on any of these matters.
DWER	3 February 2022	CAPL met with DWER and advised of the planned submission of the EP to DMIRS and provided an overview of changes to the EP. DWER ask to be kept informed on the Gorgon Gas	No objections or claims were raised.	CAPL confirmed it will continue to keep DWER informed on updates relevant to the Gorgon Gas Development through regular engagement. CAPL currently meets with

		Development through regular engagement.		DWER on an approximate monthly basis.
DAWE	14 February 2022	Email informing DAWE that the EP is being revised and CAPL is seeking feedback from relevant stakeholders.	N/A	N/A
	15 February 2022	Phone call with DAWE to discuss the scope of the EP. Follow up email from DAWE drawing CAPL's attention to the requirements of the Gorgon EPBC conditions 2003/1294 and 2008/4178.	No objections or claims were raised. DAWE requested confirmation that the revision of the EP would not affect the Gorgon EPBC conditions, in particular the monitoring program required under condition 19.	CAPL responded via email confirming the 5-year revision of the EP would not affect the Gorgon EPBC conditions and the monitoring requirements of condition 19 will continue to be managed in accordance with the Terrestrial and Subterranean Environment Monitoring Program (GOR-COP-01696). CAPL confirmed it will continue to keep DAWE informed on relevant Gorgon Project updates.
DJTSI	27 February 2022	Email informing DJTSI that the EP is undergoing the required 5-year revision.	DJTSI acknowledged receipt of information and provided no objections or claims to the information provided.	N/A

1.5.3 Ongoing Consultation

CAPL will continue to provide updates regarding Gorgon Operations (as required) at regular informal meetings with these stakeholders.

DAWE and DWER continue to receive annual updates on Gorgon status and environmental performance, including CO_2 related activities, via existing regulatory defined avenues such as annual performance reporting, annual compliance reporting and incident notifications.

For other interested stakeholders, these annual reports are publicly available on the CAPL website (https://www.chevronaustralia.com/our-businesses/gorgon/environmental-approvals).

A Memorandum of Understanding has been established between DBCA and CAPL formalising communication arrangements, ensuring DBCA are kept informed of Gorgon related activities.

2.0 Description of the Activity

The activities associated with the operation of the CO_2 Pipeline and Wells include:

- Commissioning and Start-up (Section 2.2)
- Operations (Section 2.3)
- Inspections, Maintenance, and Repair (IMR) (Section 2.4).

Section 2.1 summarises the CO_2 Injection System and includes general details on the location and layout of the infrastructure associated with the CO_2 Pipeline and Wells.

2.1 Carbon Dioxide Injection System Overview

The CO_2 Injection System is designed to dispose, by underground injection, the volume of reservoir carbon dioxide that is removed during routine gas processing operations at the GGTP that would otherwise be vented to the atmosphere.

The separation of reservoir CO_2 from feed gas occurs at the GGTP. The reservoir CO_2 is then transported via an underground pipeline to a series of three drill centres (DC-A, DC-B, and DC-C), each comprising several injection wells, located approximately 1.2 km, 3.6 km, and 6.3 km north of the GGTP. At these drill centres, reservoir CO_2 is injected into the Dupuy Formation, which is situated more than 2000 m beneath Barrow Island and which is overlain by several sealing formations including the Basal Barrow Group Shale.

Two reservoir surveillance wells, located at DC-A and DC-C, are used to periodically monitor the movement of reservoir CO_2 when it sweeps these locations. Another surveillance well (CO_2 data well) near DC-B monitors the pressure in the overlying Lower Barrow Group and passive microseismic measurements. Pressure within the Dupuy Formation is managed via four pressure management wells located at DC-D and DC-E more than 4 km west of the pipeline and injection wells. To partially offset increasing reservoir pressure from CO_2 injection, formation water is extracted via the four pressure management wells, which is then injected into the overlying Upper Barrow Group. The pipeline and wells are protected from corrosion via an impressed current cathodic protection system and protected from internal corrosion by dew point management of CO_2 entering the pipeline system. The system also comprises support infrastructure (e.g. utility power supply; communication infrastructure).

2.1.1 Timing

Initial commissioning and start-up activities commenced in Q3 2019. Operations are expected to continue for the nominal operational design life (minimum 50 years).

2.1.2 CO_2 Pipeline

A 300 mm nominal diameter carbon steel pipeline runs approximately 7.3 km from the pig launcher in the GGTP to a pig receiver at the northernmost Injection Drill Centre (DC-C). The pipeline transports reservoir CO_2 from the GGTP to the three Injection Drill Centres. Three offtake ‘barred-tees’ deliver the reservoir CO_2 to the Injection Drill Centres; at each CO_2 Injection Drill Centre, a short riser from the offtake barred tee is above surface and connected to two manually operated isolation valves. These valves allow for the drill centre manifold and well heads to be isolated from the pipeline.

2.1.3 CO_2 Injection Drill Centres

Three CO_2 Injection Drill Centres (DC-A, DC-B and DC-C) receive reservoir CO_2 from the pipeline offtakes. Each drill centre comprises a central manifold connected by flowlines to ‘Christmas tree’ structures on multiple injection wells. Wellhead and manifold facilities are

surrounded by protective bollards. The locations of the injection drill centres and wells are shown in Figure 1-1.

2.1.4 Surveillance Wells

Two Reservoir Surveillance Wells (A-RS1 and C-RS2, located within DC-A and DC-C respectively) are used to periodically monitor the CO_2 saturation and movement in the injection interval. The Gorgon CO_2 Data Well has been converted to measure pressure in the overlying Lower Barrow Group and also detect microseismic events. The locations of the drill centres are shown in Figure 1-1.

2.1.5 Pressure Management Drill Centres

The Pressure Management Drill Centres (DC-D and DC-E) are more than 4 km west of the nearest Injection Drill Centre (Figure 1-1) and are linked to the injection system via power and fibre-optic communications cables. Each Pressure Management Drill Centre has two water production wells connected by spools to water injection wells that are each capable of pumping up to 3,180 m^3 of formation water, per day. Production wells are fitted with electrical submersible pumps (ESP) and extract water from the Dupuy Formation. Water production and injection facilities are surrounded by protective bollards.

A hydro-cyclone unit and bin (solid collection skid), along with filtration units are installed at each of the two Pressure Management Drill Centres, DC-D and DC-E. The purpose of the solid removal package is to separate any solids that are extracted from the Dupuy Formation water prior to re-injection into the Barrow Group.

Other associated ancillary equipment supporting the solids removal package at each Pressure Management Drill Centre may include but is not limited to a diesel generators, pumps, and air compressors. The solids removal package will require daytime and night-time oversight by personnel, and as such office space and ablution facilities are also be provided on site at each Pressure Management Drill Centre.

2.1.6 Utility Power and Fibre-optic Cables

Utility power and fibre-optic communications cables installed along the pipeline ROW enable the monitoring and control of the CO_2 Pipeline and Wells. Cables are located above ground in a utility corridor between the GGTP and a point where the ROW crosses the GGTP ground flare pipeline. From the flare crossing point, the utility power and fibre-optic cables are installed in a common trench with the CO_2 Pipeline at a minimum depth of approximately 750 mm, and then branch off from the main trench to the CO_2 Injection Drill Centres. Cables extend from DC-A to DC-E, and from DC-C to DC-D in a utility corridor that follows the existing road infrastructure (Figure 1-1). In addition, cabling extends from DC-B to the CO_2 Data Well following the existing road infrastructure. Substations are located at the drill centres, with fenced transformers at DC-D and DC-E.

2.1.7 Cathodic Protection

The CO_2 Pipeline and Wells are protected from external corrosion by an impressed current cathodic protection system, comprising up to 12 sacrificial anode ground beds with power provided from the GGTP via the utility power cables (Figure 1-1). Above-ground cathodic protection test posts are installed along the ROW and at the drill centres to allow for inspection (Section 2.4.1).

2.2 Commissioning and Start-up

Commissioning was completed in 2019, however fit for purpose commissioning activities may be required in future. Commissioning and start-up activities will be supported on site by a small team of field personnel who undertake observations at the drill centres or IMR

activities. Information regarding IMR activities and associated vehicle operations is provided in Section 2.5.

2.2.1 CO_2 Pipeline and Injection Drill Centres

Commissioning and start-up of the CO_2 Pipeline and Injection Wells involves introducing reservoir CO_2 to the system by opening the isolation valve within the GGTP. Prior to the introduction of supercritical CO_2 into the pipeline, the following activities are undertaken:

- removal of pipeline valves to upgrade the valves to protect against corrosion.
- mechanical cleaning of the pipeline using brush and foam pigs; and rotta jetting or equivalent on the pipeline lateral lines, which cannot be pigged.
- chemical cleaning of the pipeline using ~5% citric acid and/or demineralised water/mono-ethylene glycol (MEG); discharged to temporary tanks on the drill centres and removed from the Operational Area.
- nitrogen inertion of the pipeline
- reinstatement of the valves
- leak testing of pipeline using high-pressure membrane nitrogen
- vacuum-drying of pipeline and drill centres using cryogenic nitrogen, which is vented.
- an intelligent pig run may be completed to baseline the pipeline prior to the introduction of CO_2 from the GGTP.

Start-up is initiated by introducing cryogenic CO_2 into the pipeline to pressurise and warm up the system, which requires venting at the pig launcher and drill centres.

Once the required operating temperature has been reached at the drill centres, injection will commence into the reservoir.

Filters located upstream of the wells may be used to protect the injectivity of the formation by filtering out any remaining particulate matter if required.

2.2.2 Pressure Management Drill Centres

Commissioning and start-up at the pressure management wells is controlled from the Central Control Room (CCR) by opening valves and starting ESPs to allow the production and reinjection of water. Prior to injection commencing, the following activities are undertaken:

- reinstatement of hook-up spools, power and controls to the wellhead
- leak testing of piping using high pressure nitrogen
- function testing of valves and instrumentation
- commissioning of the chemical injection spread (using water) and introduction of chemical treatment
- start-up of the submersible pumps in the source water wells

Injection into the water disposal wells while injecting treatment chemicals can then commence.

Production testing of the pressure management system may occur to gather data in relation to the pressure response of the Dupuy Formation.

2.3 Operations

The principal activity during operations is the steady-state flow of super-critical CO_2 through the pipelines. This flow is monitored and controlled from the Central Control Room (CCR) on Barrow Island.

The CO_2 is disposed of via subsurface injection into the Dupuy Formation. The CO_2 injection system infrastructure in conjunction with the GGTP was designed and constructed to dispose by underground injection 100% of the volume of reservoir CO_2 removed during routine gas processing operations. The peak design rate for CO_2 injection is 276 MMscf/d; the peak design annualised rate of CO_2 injection is 254 MMscf/d (Note: Actual flow rates may be lower than these design rates depending on such matters as Gorgon Field production performance, facility up-time and the CO_2 injection reservoir performance).

Pressure in the formation is monitored in the injection wells during operations, with pressure management achieved by withdrawing water from the Dupuy Formation via the water production wells and reinjecting it via the water injection wells into the overlaying Upper Barrow Group, a large regionally extensive aquifer, which is hydraulically isolated from the surface environment.

To support the maintenance of the pressure management wells and interconnecting spools, scale inhibitor is added in low concentrations to the water prior to reinjection. Other treatments that may be added to the water from time-to-time include oxygen scavenger and biocide to remove oxygen and kill bacteria in the injection water respectively.

Due to hydrocarbon gas observed in the pressure management wells, there may be a requirement to vent gas to the atmosphere. In addition, liquid hydrocarbons have been detected in the Dupuy formation water and may be removed from the water injection stream and disposed in accordance with the *Gorgon Gas Development and Jansz Feed Gas Pipeline Solid and Liquid Waste Management Plan* (GOR-COP-01286).

2.4 Inspections, Maintenance, and Repair

IMR of the CO_2 Injection System is undertaken to ensure integrity of the system is maintained at or above acceptable standards. IMR activities may occur at any time during commissioning, start-up, or operations.

2.4.1 Inspections

Inspections are performed to check the integrity of the CO_2 Pipeline and Wells, and proactively identify maintenance or repair activities that may be required. Inspections may be routine, or may be triggered by specific events (such as cyclones or seismic events) that could affect the infrastructure. Potential inspection techniques include:

- visual inspections
- cathodic protection measurements
- pigging (in-line inspections)
- non-destructive testing.

2.4.2 Maintenance and Repairs

Maintenance and repair activities may need to occur during the operational life of the Gorgon Project to:

- prevent deterioration and/or failure of infrastructure
- maintain reliability and performance of infrastructure.

Repairs to the facilities are not planned activities; therefore, it is difficult to confirm the exact characteristics of a repair in advance (e.g. location, extent, duration).

However, maintenance and repair activities are expected to be rare and infrequent, though the exact frequency of maintenance activities depends on the results of inspections. Such activities may comprise:

- maintenance of the ROW and licence areas
- maintenance of facilities and equipment
- maintenance of cathodic protection systems
- pigging (in-line maintenance/cleaning)
- repairs -may involve spot repairs or replacing sections of pipe, and may require excavation. Re-commissioning of the pipeline post-repair may include vacuum drying, nitrogen inertion, pressurisation, warm-up of the pipeline and drill centres (which requires venting), before reinjection can re-commence.

2.5 Vehicles and Equipment

Onshore IMR activities are expected to be undertaken within the Operational Area. Activities are expected to take place during daylight hours; however, some maintenance (e.g. at the pig receiver station) or urgent repair activities in the Operational Area may also need to occur at night. ROW inspections are expected to be undertaken approximately every two months and involve a small number of personnel and a single light vehicle driving along the ROW for a day.

Vehicles and equipment used for maintenance and repairs are expected to include:

- combination of light vehicles and trailer for personnel transport and support;
- flatbed trucks for transporting excavators, cranes, and other equipment; vacuum trucks; tipper trucks for backfill and/or spoil removal; and a range of hand tools.
- lighting may be used, but only if maintenance and repair activities must be undertaken at night.
- Temporary diesel generators.

To support the use of the solids removal package, there will be light vehicle movement to transport personnel to the Pressure Management Drill Centre sites at DC-D and DC-E on a daily basis. Other vehicle movement is expected to include a waste truck and small crane for removal of solid waste, vacuum trucks for removal of liquid waste, and other vehicle movement related to solids removal activities as required.

3.0 Description of the Environment

The potential extent of the environmental aspects and impacts arising from planned activities during the commissioning, start-up, operation, and IMR of the CO_2 Pipeline and Wells is expected to be limited to the Operational Area (see Section 3.2.4).

However, the potential extent of the environmental aspects and impacts arising from unplanned events or from infrequent and non-routine activities may have a localised effect on the land environment immediately adjacent to the Operational Area, as described and risk assessed in Section 5.0.

The description of the environment is structured as follows:

- Barrow Island conservation status (Section 3.1)
- the physical environment of Barrow Island (Section 3.2)
- the environment associated with the Operational Area where planned activities occur (Section 3.2.4)
- the environment associated with land adjacent to the Operational Area that may be affected if an unplanned event occurs (Section 3.3.1).

3.1 Barrow Island Conservation Status

Barrow Island is reserved under the *Conservation and Land Management Act 1984* (WA) as a Class A Nature Reserve for the purpose of conservation of flora and fauna.

3.2 Physical Environment of Barrow Island

3.2.1 Climate

Barrow Island is characterised by an arid subtropical climate with daytime temperatures ranging from 20 to 34 °C in summer, and from 17 to 26 °C in winter (Ref. 1). Average annual rainfall at Barrow Island is 318 mm with most rain (85%) occurring between January and July (Ref. 1). Rainfall is generally associated with tropical cyclones, which may occur between November and April. Between 1960 and 2003, an average 3.84 cyclones passed within 400 nm of Barrow Island each year (Ref. 2).

3.2.2 Geology, Landform and Soils

The surface geology of Barrow Island generally comprises calcarenite and limestone overlain by alluvium, colluvium, and aeolian sand. Tertiary limestone ridges occur throughout the central upland plateaus of Barrow Island. The terrain ranges from steeper slopes in the west, to flatter, more gentle undulations as the ridges continue east (Ref. 1). Soil types are highly variable, ranging from ‘silty clays’ and ‘clayey loam’ textures in western parts of Barrow Island to coarser ‘clayey sands’, ‘sandy loams’ and ‘sandy clays’ dominating towards the east (Ref. 3).

3.2.3 Hydrogeology

The surface hydrology on Barrow Island is characterised by run-off and short-term standing water after rainfall events, high rates of evaporation, and high infiltration capacities of the surface sands and limestone (Ref. 1). The Operational Area traverses several highly seasonal drainage lines, which generally align in a west-east orientation, but does not cross any permanent watercourses (Ref. 1). All watercourses are ephemeral and typically only flow for short periods following high-intensity rainfall, such as that associated with severe storms or cyclones (Ref. 1).

There is one shallow unconfined potentially freshwater aquifer on Barrow Island. This freshwater aquifer forms a lens of relatively fresh groundwater at depths typically between 9 m and 53 m, and floats upon denser, saline groundwater located predominantly within the Tertiary Limestone (Ref. 2). Although beneficial uses of this freshwater aquifer are limited, it is an important environment for the stygofauna identified on Barrow Island.

Salinity of the water in this lens varies considerably across Barrow Island. Recharge to the aquifer is from rainfall and occurs most rapidly in areas of highly permeable soils overlying porous karst limestone. Lower salinities occur in areas of more rapid groundwater recharge. Higher salinities occur where recharge is slower, generally in areas where clays and silts are overlying the more porous and permeable limestone.

Salinity of the lens is also higher in coastal areas where seawater influx occurs close to the surface of the water-table.

Several saline ground water systems occur on Barrow Island:

- Tertiary Limestone extending from the mean sea level down to approximately 300 m below mean sea level
- Windalia Sand Member of the Muderong Shale, generally at depths between 650 m and 700 m below mean sea level
- the Barrow Group comprising the Flacourt and Malouet Formations and the Flag Sandstone, generally at depths between 1000 m and 2000 m below mean sea level
- the Dupuy Formation, generally at depths between 2000 m and 2300 m below mean sea level
- the Biggada Formation generally at depths greater than 3000 m below mean sea level.

The Dupuy Formation and Barrow Group systems are described in more detail below.

3.2.3.1 Barrow Group Formation

The Barrow Group Formation is an underground saline aquifer situated at depths between 1010 m and 1900 m below the surface; it is divided into three separate formations—the Flacourt Formation, Malouet Formation, and Basal Barrow Group Shale (Figure 3-1). The Flacourt Formation is the proposed receiving interval for the produced Dupuy Formation water in the pressure management system. The Flacourt and Upper Malouet Formations (collectively referred to as the Upper Barrow Group) are the receiving intervals for the produced Dupuy Formation water in the pressure management system. The Flacourt Formation comprises sandstone-dominated sandstone/shale sets. Of the core data points taken for the Flacourt Formation, high formation quality was exhibited (Ref. 4).

The underlying Malouet Formation also comprises interbedded sands and shales, although the reservoir quality is not as high as the Flacourt. A pressure baffle within the Malouet Formation hydraulically separates the Lower Malouet Formation from the Upper Malouet Formation. This zone is monitored for pressure changes in the Gorgon CO_2 Data Well. At the base of the Barrow Group is the Basal Barrow Group Shale, which is the top seal (cap rock) for the underlying Dupuy Formation, and hence is the seal for the injected reservoir CO_2.

The components of the upper Barrow Group (Flacourt and Upper Malouet Formations) behave as a single, hydraulically connected unit; however, the Barrow Group Formation is hydraulically separated from the shallow unconfined Tertiary Limestone by a thick sequence (more than 1000 m) of low permeability material (Ref. 4). Water quality is highly alkaline and saline (Total Dissolved Solids [TDS] approximately >30 000 mg/L), and contains hydrocarbons. It is generally characterised as containing stable minerals with a very low proportion of soluble metals.

A thick sequence of low permeability material (Muderong Shale and Gearle Siltstone) hydraulically separates the Barrow Group from the surface groundwater aquifer. The shallow unconfined aquifer forms a lens of fresher groundwater floating upon the denser, more saline sea water. Seasonal fluctuations in rainfall and tidal influence affect this boundary between the fresh and saline water making it a transition zone, rather than a clear boundary (Ref. 5).

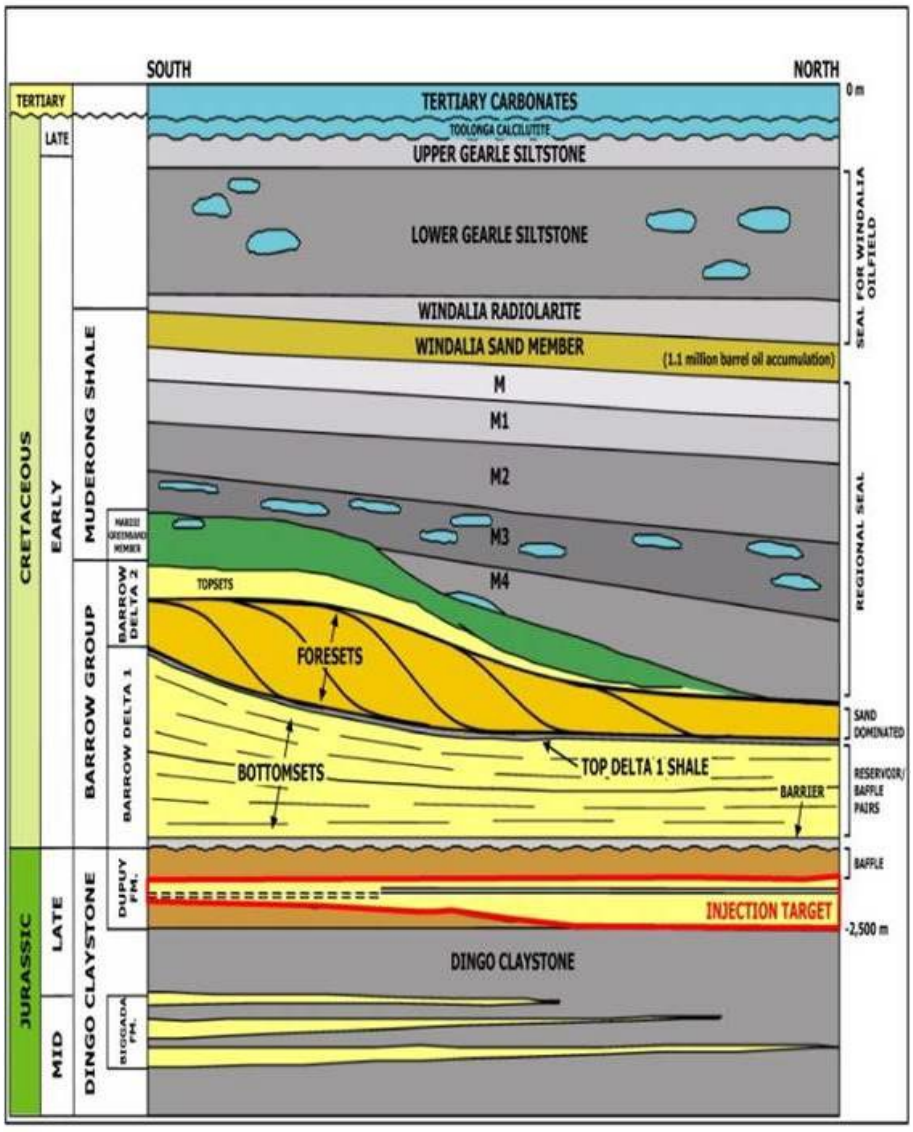


Figure 3-1: Hydrogeological Formations on Barrow Island

3.2.3.2 Dupuy Formation

Water produced from the Dupuy Formation is brackish (approximately 5000–6000 mg/L sodium chloride; 7000–8000 ppm TDS), and may occur at temperatures up to approximately 100 °C upon release (Ref. 6). Naturally occurring dissolved hydrocarbons and metals have been identified in the formation water.

3.2.4 Surface water

All drainage lines on Barrow Island are ephemeral and typically only flow for short periods of time following high intensity rainfall such as that associated with storms or cyclones. Operational experience suggests these drainage lines are likely to be inundated between 3-7 days, depending on rainfall.

3.3 Operational Area

The Operational Area comprises land that was cleared and disturbed during construction and installation activities. Consequently, the particular values and sensitivities associated with the Operational Area are limited.

3.3.1 Terrestrial Flora and Vegetation

No particular flora and vegetation values or sensitivities are located within the Operational Area. All flora and vegetation within the Operational Area were cleared during construction. Weed species, including Buffel Grass, have been recorded in various locations on Barrow Island and CAPL has established Weed Hygiene Zones (WHZs) for management purposes, including areas that transect the Operational Area.

3.3.2 Ecological Communities

No Threatened Ecological Community, as listed in the Parks and Wildlife's Threatened Ecological Database (Ref. 7), has been recorded or is known to occur on Barrow Island.

Barrow Island is recognised as being of high conservation significance for subterranean fauna communities, with 19 troglofauna and 63 stygofauna species recorded to date. Ten subterranean fauna species recorded on Barrow Island are listed as specially protected fauna under the *Biodiversity Conservation Act 2016* (WA) and two species, the Blind Gudgeon fish *Milyeringa justitia* (*M. veritas*) and Blind Cave Eel *Ophisternon candidum*, are listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (*EPBC Act). Barrow Island subterranean fauna communities are listed by Parks and Wildlife as a Priority 1 Ecological Community ('not adequately defined').

Preliminary geological reviews suggest that strata on Barrow Island (e.g. interbedded sand/limestone) are relatively continuous (Ref. 8), and it is expected that if subterranean fauna occur beneath the Operational Area, it would be of no greater significance to that present elsewhere on Barrow Island. Subterranean fauna is known to exist up to approximately 50 m below ground level. Shallow surface formations and the watertable identified as subterranean fauna habitat are geologically isolated from the deeper formations.

3.3.3 Significant Fauna Habitats

The Operational Area was cleared during construction and does not provide any habitats of particular value or sensitivity.

3.3.4 Terrestrial Fauna

In the absence of fauna habitats of particular value or sensitivity, the Operational Area does not specifically support terrestrial fauna values, although mobile and transient fauna may be encountered in the Operational Area, including mammal, bird, and reptile species.

Four resident mammal species that may be encountered in the Operational Area are listed as specially protected fauna under the *Biodiversity Conservation Act 2016* (WA) or listed as Vulnerable under the EPBC Act. They are Barrow Island Euro *Macropus robustus isabellinus*, Spectacled Hare-wallaby *Lagorchestes conspicillatus*, Barrow Island Golden Bandicoot *Isoodon auratus barrowensis*, and Boodie *Bettongia lesueur*. All these species are widespread across Barrow Island.

Barrow Island supports numerous species of migratory shorebirds as well as resident shorebirds. Many of these species are protected under International treaties (e.g. JAMBA, CAMBA, ROKAMBA). Barrow Island is both a staging site and an important non-breeding site for migratory shorebirds. The highest abundance of shorebirds on Barrow Island, with

over two-thirds of records for most species, is associated with the south-eastern and southern coasts of the Island.

All avifauna with the potential to be encountered in the Operational Area occur widely across Barrow Island. The most common terrestrial avifauna species that have the potential to be encountered are the Spinifex-bird *Eremiornis carteri*, White-winged Fairy-wren (Barrow Island) *Malurus leucopterus edouardi*, Singing Honeyeater *Lichenostomus virescens*, White-breasted Wood Swallow *Artamus leucorhynchus*, and the Welcome Swallow *Hirundo neoxena* (Ref. 1). The White-winged Fairy-wren (Barrow Island) is the only terrestrial bird species on Barrow Island to be listed as Vulnerable under the *Biodiversity Conservation Act 2016* (WA) and the EPBC Act (Ref. 1), but the species is abundant in most habitats on Barrow Island (Ref. 1; Ref. 9) Other listed terrestrial avifauna species with the potential to be encountered in the Operational Area include four vagrant or migratory species protected under international agreements (Oriental Cuckoo *Cuculus saturatus*, Fork-tailed Swift *Apus pacificus*, White-throated Needletail *Hirandapus caudacutus*, and Yellow Wagtail *Motacilla flava*) and the Australian Bustard *Ardeotis australis*, which is listed by DBCA as a Priority 4 species (‘rare, near-threatened and other species in need of monitoring’) (Ref. 1).

Reptile species also have the potential to be encountered in the Operational Area, although all species are abundant and widespread on Barrow Island, and none are listed as threatened under the *Biodiversity Conservation Act 2016* (WA) or the EPBC Act (Ref. 1).

3.3.5 Cultural Heritage

Cultural heritage surveys have not identified any cultural heritage sites or materials within the Operational Area.

3.3.6 Petroleum Activities and Infrastructure

Barrow Island has been actively used for petroleum exploration and production activities since 1957 and access is restricted to personnel associated with the oilfield operations, the Gorgon Gas Development, and DBCA staff. Infrastructure associated with the Gorgon Gas Development Project, and the Barrow Island oil field road network traverse the Operational Area and adjacent land.

The Barrow Island oil field extracts crude oil, water and gas from the Windalia, Mardie B, M3, Gearle, Jurassic, Malouet and Tunney Formations on Barrow Island. Formation water for pressure management is extracted from Barrow Group Flacourt Formation, processed then injected into the Windalia Formation. Formation water is re-injected into the Windalia reservoir and also disposed of to the Barrow Group Flacourt Formation.

3.4 Land Adjacent to the Operational Area

In the unlikely event of an unplanned incident, there is the potential to expose the environment outside the defined Operational Area. As such, this area is described in the following subsections.

3.4.1 Terrestrial Flora and Vegetation

The flora and vegetation of Barrow Island, including the land adjacent to the Operational Area, is typical of the arid Pilbara region, and also has floral affinities with the Cape Range area on the mainland in the dominance of *Triodia* hummock grasses and sparse, low-lying *Melaleuca* shrubs (Ref. 10; Ref. 11). No Declared Rare Flora, pursuant to the *Biodiversity Conservation Act 2015* (WA), or Threatened Flora species or plant communities listed under the EPBC Act have been recorded anywhere on Barrow Island.

Vegetation associations on land adjacent to the Operational Area are described as seasonal drainage line associations, associations located on flats, limestone hillslope

associations, and disturbed limestone slope associations. These associations are generally characterised by varying combinations of *Triodia* grasses and shrub species such as *Melaleuca cardiophylla*, *Acacia* spp., *Hakea lorea*, *Gossypium robinsonii*, and *Petalostylis labicheoides* (Ref. 1; Ref. 12). A hybrid population of *Acacia bivenosa* x s*clerosperma* subsp. *sclerosperma* was found in a drainage line approximately 40 m from the pipeline ROW near DC-B; this population has remained stable and in good condition throughout construction (Ref. 13; Ref. 14).

One Priority 3 ('poorly known') flora species (*Corchorus congener*) listed by Parks and Wildlife has previously been recorded near the Operational Area (Ref. 15; Ref. 16). Priority 3 flora is a non-legislative category aimed to manage plant taxa listed by Parks and Wildlife that are known from only a few collections or sites in WA, that have not been adequately surveyed, but are not considered under imminent threat. *Corchorus congener* is widespread across Barrow Island (Ref. 12) and the land adjacent to the Operational Area is not considered to be of any particular significance to this species.

3.4.2 Ecological Communities

Subterranean fauna communities, supporting species of troglofauna and stygofauna listed under the *Biodiversity Conservation Act 2016* (WA) and EPBC Act (as described in Section 3.3.2) may occur beneath the land adjacent to the Operational Area, but are not expected to be of any greater significance to that present elsewhere on Barrow Island.

On Barrow Island, *Triodia angusta* dominated 'Creekline Vegetation' communities are listed by DBCA as a Priority 1 ('poorly known or not adequately defined') Ecological Community. However, the listing of Barrow Island 'Creekline Vegetation' as a Priority Ecological Community (PEC) reflects the level of disturbance as a result of past land use management practices, and the PEC does not include previously disturbed creeklines (Ref. 13). Although some seasonal drainage line vegetation associations adjacent to the Operational Area may comprise similar compositions of plant species to the Creekline Vegetation PEC, the drainage lines are classed as previously disturbed and therefore are not classified as PEC.

3.4.3 Significant Fauna Habitats

Habitats on Barrow Island considered important for their high biodiversity or for supporting protected or rare and endangered fauna include termite mounds and Boodie warrens. Termite mounds occur widely across Barrow Island including on land adjacent to the Operational Area (Ref. 1). Boodie warrens are widely and evenly distributed in low density across Barrow Island. Surveys indicate that the two closest Boodie warrens are approximately 100 m from the Operational Area (Ref. 1).

Vegetation adjacent to the Operational Area may also provide nesting habitat for the White-winged Fairy-wren (Barrow Island), but the species nests in a wide variety of habitats across Barrow Island (Ref. 1; Ref. 9).

Barrow Island drainage lines are considered to be Priority Ecological Communities, however this listing does not extend to drainage lines that have been previously disturbed. Vegetation also slows water flow, which decreases erosion, sediment loss, turbidity at outflows into the ocean, and increases water recharge.

3.4.4 Terrestrial Fauna

Mobile and transient mammals, birds and reptiles, as described in Section 3.3.4, are expected to be present on the land adjacent to the Operational Area, although the land is not expected to be of specific significance to fauna.

3.4.5 Cultural Heritage

Four isolated aboriginal heritage artefacts, comprising stone flakes and fragments, are located within ~100 m of the Operational Area (Ref. 17; Ref. 18; Ref. 19; Ref. 20).

3.4.6 Petroleum Activities and Infrastructure

As described in Section 3.3.6, infrastructure associated with the Gorgon Gas Development Project, and the Barrow Island oil field road network traverse land adjacent to the Operational Area.

4.0 Environmental Risk Assessment Methodology

An Environmental Risk Assessment Workshop was undertaken to evaluate impacts and risks arising from the petroleum activities described in Section 2.0. The risk assessment also considered emergency conditions and spill response activities.

The risk assessment was undertaken in accordance with *ABU OE Risk Management Process* (Ref. 21) and the processes outlined in ISO 31000:2018 Risk Management – Principles and Guidelines and Handbook 203:2012 Managing Environment-related Risk (Ref. 22).

The environmental impact and risk evaluation process comprised these components:

- identification and description of the petroleum activity
- identification of particular environmental values
- identification of relevant aspects
- identification of relevant environmental hazards
- exposure evaluation
- evaluation of impacts and risk
- consequence
- control measures and as low as reasonably practicable (ALARP) evaluation
- likelihood
- quantification of the level of risk
- risk acceptance criteria
- environmental performance objectives, standards, and measurement criteria.

Table 4-1 summarises the environmental impacts, risks, and control measures in place to manage the activity.

Table 4-1: Summary of the Potential Impacts Risks and Control Measures

Source of Environmental Impact or Risk (Hazards)	Potential Environmental Impacts and Risks (Consequences)	Control Measures
Operation of CO_2 Pipelines or Wells has the potential to result in an unplanned release of CO_2	A release of CO_2 has the potential to result in above-ground impacts such as: • localised asphyxiation hazard to terrestrial fauna if CO_2 settles temporarily in low-lying areas A release of CO_2 has the potential to result in below-ground impacts such as: • localised plant stress impacts from increases in soil CO_2 concentrations • change the physical properties of subsurface formations resulting in impacts to subterranean communities	• Hydrotesting / pressure testing, conducted in accordance with industry standards, was carried out on the CO_2 Pipeline and Wells (completed in the construction phase) • Inspection, monitoring, and maintenance of the CO_2 pipeline ROW and drill centres, aligned with the CO_2 Pipeline Inspection, Maintenance and Monitoring Plan (Ref. 23), including but not limited to: ○ scheduled visual inspection of the pipeline ROW and drill centres ○ intelligent pigging (assessment of wall thickness) ○ Cathodic Protection (CP) Potential Monitoring Survey ○ Direct Current Voltage Gradient (DCVG). • A permit, including a risk assessment, is approved before excavation associated with IMR activities, as part of the PTW system. • An LDS is in place to detect potential leaks in the CO_2 Pipeline and Wells. • Permit to Work (PTW) system includes a risk assessment that identifies risks associated with onshore excavation activities and includes an approved PTW Shutdown and venting of the CO_2 Pipeline and Wells is undertaken in accordance with CO_2 System Integrated Operations Depressurisation Operating Procedure (Ref. 24), including, but not limited to: ○ valve closure sequencing; ○ pipeline venting protocol. • The CO_2 Disposal Management Plan (Ref. 25) will be implemented throughout the duration of CO_2 injection operations • Well barriers are designed to maintain safe operating conditions • Source control activities and will be conducted in accordance with the ABU Source Control Contingency Plan (Ref. 42).

Source of Environmental Impact or Risk (Hazards)	Potential Environmental Impacts and Risks (Consequences)	Control Measures
Operation of pressure management wells has the potential to result in an unplanned release of Dupuy Formation water	A release of higher-temperature brackish Dupuy Formation water, containing hydrocarbons has the potential to result in localised impacts to seasonal drainage line vegetation, and to underlying stygofauna	• Hydrotesting, conducted in accordance with industry standards, is carried out on the water spool lines (completed in the construction phase) • Regular visual inspection will be undertaken of the Pressure Management drill centres • Pressure management wells will be equipped with functional pressure meters to provide real-time pressure data to the CCR • Pressure management wells are fitted with trip shutdown valves and maintained in accordance with the CMMS • Well barriers are designed to maintain safe operating conditions • Source control activities and spill response will be conducted in accordance with the Gorgon Project – Barrow Island Onshore Spill Contingency Plan (Ref. 28).

Operation of the solids removal package at the Pressure Management Drill Centres has the potential to result in unplanned release of Dupuy formation water and hazardous materials	A release of brackish formation water containing hydrocarbons or a release of solid material from the Dupuy Formation (which may contain hydrocarbon and heavy metals) has the potential to result in localised impacts to seasonal drainage line vegetation, underlying stygofauna and terrestrial fauna	• Leak testing conducted in accordance with industry standards is carried out on the solids removal equipment, prior to operation of equipment commencing
		• Solid and liquid hazardous materials will be stored, handled and transferred appropriately, including where required:
		  ○ having secondary containment for the hydro-cyclone unit bins, tanks and hose connections
		  ○ relevant stationary equipment which contains hazardous materials, such as diesel generators will be self-bunded
		  ○ use of spill protection during transfer
		• Equipment and machinery will be maintained, as per manufacturer specifications
		• Spill response will be conducted in accordance with the Gorgon Project – Barrow Island Onshore Spill Contingency Plan (Ref. 28). (Ref. 28).

Planned venting of hydrocarbon gas during operations and CO_2 during CSU has the potential to result in a temporary and localised reduction in air quality and to generate noise emissions	A release of hydrocarbon gas or CO_2 has the potential to result in: • acute impacts to avian fauna if they are exposed to the changes in air quality • behavioural disturbance to fauna from noise emissions	• A vent restriction orifice will be installed at the annulus vent line at the pressure management wells to control the rate of planned venting of hydrocarbon gas • Venting will be conducted in accordance with a Standard Operating Procedure / Work Instruction • CO_2 vent valves have Allowable Sound Pressure Level of 110 dB @ 1 m
The release of greenhouse gas (GHG) emissions into the atmosphere as a result of planned and unplanned release scenarios	Contribution to the atmospheric GHG load	• Compliance with the emissions reduction targets outlined in the Gorgon Greenhouse Gas Management Plan required under Condition 27 of MS 800 • GHG emissions will be measured and recorded in accordance with NGER Act requirements

Source of Environmental Impact or Risk (Hazards)	Potential Environmental Impacts and Risks (Consequences)	Control Measures
Lighting to safe night works may result in behavioural disturbance to fauna	Localised and temporary changes in artificial light emissions can disorient fauna or cause behavioural impacts, potentially resulting in injury or mortality.	• Lighting is managed in accordance with the requirements of the Long-term Marine Turtle Management Plan, including where practicable: ○ Use of long-wavelength and low wattage light sources (i.e. amber) subject to operational and safety requirements ○ Task lighting to be facing downward and directed to work areas
Excavation within WHZs for inspection and maintenance activities has the potential to spread weeds	Spreading weeds has the potential to change vegetation and ecological community structure, composition, and diversity	• An assessment, in alignment with the PTW system, will be completed before vegetation disturbance and excavation activities in WHZs to confirm the required control measures, including: ○ visual inspection of personnel, vehicles, and equipment before exiting the WHZ ○ cleandowns, if soil, seeds, or plant material are detected by the visual inspection ○ controls to prevent the spread of weeds while transporting soil (e.g. covers over loads on the back of vehicles and trailers). • Quarantine response will be implemented following the detection of a new weed species or proliferation of an existing weed species within the Operational Area, as per the QMS (Ref. 36)

Source of Environmental Impact or Risk (Hazards)	Potential Environmental Impacts and Risks (Consequences)	Control Measures
Transfer, storage and usage of chemicals at the Drill Centres	A chemical spill has the potential for localised soil contamination and groundwater contamination, and associated impacts to flora and vegetation adjacent to the Operational Area	• All chemical containers (e.g. IBC's) will be stored within the Chemical Injection Skids or an appropriately bunded area at the pressure management drill centres • All chemical containers (e.g. IBC's) will be secured during transport to the drill centres • All hazardous chemicals will have secondary containment comprising the larger of 110 % of the largest tank or 25% percent of the combined tank volumes • All bulk portable tanks used to contain pipeline cleaning fluid in the Operational Area will have spill protection • Spill protection will be provided under transfer line connections • Stationary equipment (e.g. generators, pumps) will have spill protection • Lifting and unloading of bulk chemical containers from vehicles will be undertaken in accordance with the appropriate work instruction / Standard Operating Procedure • Vehicles involved in transporting bulk chemical containers / maintenance inspections will contain a spill kit • All chemicals used in the pressure management system will be selected and assessed in accordance with the ABU Hazardous Materials Management Procedure (Ref. 37) • Personnel responsible for procuring hazardous materials will complete the relevant chemical training. • All spills will be recorded as per Chevron Incident Investigation and Reporting Process (Ref. 38). • Spill response will be conducted in accordance with the Gorgon Project – Barrow Island Onshore Spill Contingency Plan (Ref. 28). • Vehicles involved in transporting bulk chemical containers / maintenance inspections will contain a spill kit.

Excavation for inspection and maintenance activities has the potential to create a trap for terrestrial fauna	Excavations left open overnight have the potential to trap terrestrial fauna, potentially resulting in injury or mortality	• A risk assessment will be completed as part of the PTW system and where potential risk to fauna is identified (e.g. for excavations greater than 0.5 m left unattended overnight) appropriate controls will be identified and implemented. Controls will include:
		  ○ egress or exclusion controls (e.g. ramps, scramble mats, battered slopes, ladders at least every 250 m within a trench, exclusion fencing, backfilling)
		  ○ inspection controls (e.g. twice daily (no more than three hours after sunrise and three hours before sunset)

Source of Environmental Impact or Risk (Hazards)	Potential Environmental Impacts and Risks (Consequences)	Control Measures

The movement of vehicles within the Operational Area has the potential to create a hazard (vehicle strike) to terrestrial fauna	Fauna death from fauna strike	• An In-vehicle Monitoring System will be installed to manage vehicle speeds within the ROW.
		• Personnel will only be eligible to drive on Barrow Island if they have:
		  ○ completed the ABU Operations Induction
		  ○ completed Barrow Island on-site driver awareness training.
		• Handling of injured fauna, where required, is undertaken by a trained fauna handler
		• Any harm or mortality to EPBC Act listed terrestrial fauna is reported in accordance with regulatory requirements.

Operating vehicles, equipment, within the drill centres has the potential to result in a collision with the well causing a release of hydrocarbon gas	A release of hydrocarbon gas has the potential to result impacts such as: • acute impacts to birds if they are exposed to the hydrocarbon gas plume.	• Vehicle barriers will be in place at the CO_2 injection and pressure management drill centres. • Prior to working within the 15m exclusion zone that is around each CO_2 injection and pressure management well to conduct any physical maintenance or repair activities, a PTW will be obtained. • Source control activities and will be conducted in accordance with the Gorgon Project – Barrow Island Onshore Spill Contingency Plan (Ref. 28).

Operating vehicles, equipment, within the drill centres has the potential to result in a collision with the well causing a release of hydrocarbon gas which if accidentally ignited during the collision could result in a fire event	A fire event may cause various environmental consequences including habitat and vegetation loss, fauna mortality and contamination.	• Vehicle barriers will be in place at the CO_2 injection and pressure management drill centres.
		• Prior to working within the 15m exclusion zone that is around each CO_2 injection and pressure management well to conduct any physical maintenance or repair activities, a PTW will be obtained.
		• In accordance with the Fire Management Plan; activities that have an identified fire / explosion risk will be completed in accordance with the requirements of an internal permit or equivalent (e.g. procedure).
		• In accordance with the Fire Management Plan; activities which have an identified fire / explosion risk present will ensure:
		  ○ Access to 24/7 emergency response capability, equipped with appropriate firefighting equipment.
		  ○ An emergency response plan will be in place and implemented in the event of a fire emergency.
		  ○ A communication system will be in place for emergency response.

5.0 Management Approach

The implementation strategy in the Plan identifies the systems, practices, and procedures used to ensure the environmental impacts and risks of the activities are continuously reduced to ALARP and the environmental performance outcomes and standards are met. These are predominantly driven through CAPL's Operational Excellence Management System (OEMS).

5.1 Operational Excellence Management System

The implementation strategy of the Plan was developed in line with CAPL's OEMS, which is aligned to ISO 14001:2015; Table 5-1 lists the key components.

Table 5-1: OEMS Elements Relevant to the Activity

Focus area or common expectation	Key processes
Focus area	
Workplace safety and health	• *Managing Safe Work (MSW): ABU Standardised OE Process* • *ABU Hazardous Materials Management Procedure: ABU Standardised OE Procedure*
Process safety, reliability and integrity	• *OE Information Management: ABU Standardised OE Process* • *Management of Change for Facilities and Operations: ABU Standardised OE Process* • *ABU Surface Equipment Reliability and Integrity Process (SERIP) Base Business: Standardised OE Process*
Environment	• *Environment Risk Management Process*
Stakeholders	• *Stakeholder Engagement and Issues Management: ABU Standardised OE Process*
Common expectation	
Risk management	• *ABU OE Risk Management Process*
Assurance	• *OE Assurance Corporate Process* • *OE Corporate Standard Incident Investigation* • *OE Data Reporting Standard*
Incident investigation and reporting	• *Incident Investigation and Reporting (II&R) Execution Manual*
Emergency management	• *Emergency Management OE Process*

5.2 Environment Plan Review

Regulation 18 of the Petroleum Pipelines (Environment) Regulations and Condition 7.5 of the Pipeline Licence (PL 93) require that CAPL submit a proposed revision of the accepted Plan to the Minister:

- before commencing a new activity
- before any significant modification or change, or a new stage of an existing activity
- before, or as soon as practicable after, any significant new environmental impact or risk occurs, or any significant increase in an existing environmental impact or risk which occurred or is to occur.

Additionally, Regulation 20 of Petroleum Pipelines (Environment) Regulations and Condition 7.6 of PL 93 require that CAPL submit a proposed revision of the Plan five years from the date when the Plan is accepted by the Minister.

6.0 Acronyms and Abbreviations

Table 6-1 defines the acronyms and abbreviations used in this document.

Table 6-1: Acronyms and Abbreviations

Acronym/Abbreviation	Definition
°C	Degrees Celsius
ABU	Australian Business Unit
ALARP	As low as reasonably practicable
CCR	Central Control Room
CAPL	Chevron Australia Pty Ltd
CO_2	Carbon dioxide
DC	Drill Centre
EMP	Environment Management Plan
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GGTP	Gorgon Gas Treatment Plant
GJV	Gorgon Joint Venture
HES	Health, Environment, and Safety
IMR	Inspection, Maintenance, and Repair
ISO	International Organization for Standardization
km	Kilometre
m	Metre
mg/L	Milligrams per litre
mm	Millimetre
nm	Nautical mile
OE	Operational Excellence
OEMS	Operational Excellence Management System
PEC	Priority Ecological Community
PGPA	Policy, Government and Public Affairs
ppm	Parts per million
PTW	Permit to Work
Q1, Q2,etc.	Three-month quarter of a calendar year
ROW	Right-of-Way
TDS	Total Dissolved Solids
WA	Western Australia
WHZ	Weed Hygiene Zone

7.0 References

Ref. No.	Document	Document No.
1.	Chevron Australia. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Terrestrial and Subterranean Environment Monitoring Program.* Perth, Western Australia.	GOR-COP-01696
2.	Chevron Australia. 2008. *Gorgon Gas Development Revised and Expanded Proposal: Public Environmental Review*. Perth, Western Australia.	
3.	Lewis, MM and Grierson, IT. 1990. *Land Units and Soils of Barrow Island.* Roseworthy Agricultural College, South Australia.	
4.	Gibson-Poole, CM. 2009. *Site Characterisation for Geological Storage of Carbon Dioxide: Examples of Potential Sites from the North West Shelf, Australia*. Doctoral dissertation, School of Petroleum, The University of Adelaide. Adelaide, South Australia.	
5.	Chevron Australia. 2015. *Gorgon Project: Liquid Waste Facility and Permanent Waste Disposal Wells Licence*. Perth, Western Australia.	
6.	Baker Petrolite. 2010. *Review of Scale , Corrosion and Production Chemical Risks: Gorgon Dupuy Depressurization Project*. Baker Hughes. BC-3009.	
7.	Department of Parks and Wildlife. *Threatened Ecological Database*. Available online https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities	
8.	Biota Environmental Sciences. 2007. *Barrow Island Gorgon Gas Development: Summary of 2004–2006 Subterranean Fauna Surveys*. Perth, Western Australia.	
9.	Bamford, AR and Moro, D. 2011. Nest Site Selection of the White-winged Fairy-wren *Malurus leucopterus edouardi* on Barrow Island. *Corella*, 35:3, pp. 84–86.	
10.	Trudgen, ME. 1989. *A Report on the Progress of the Regeneration of Vegetation on Areas Disturbed During Oil Production on Barrow Island*. Report prepared for the West Australian Petroleum Pty Ltd. Perth, Western Australia.	
11.	Mattiske Consulting Pty Ltd. 1997. *1996 Assessment of Revegetation on Seismic Lines, Barrow Island*. Perth, Western Australia.	
12.	Astron Environmental Services. 2010. *Gorgon CO_2 Injection Pipeline Flora & Vegetation Survey – April 2010*. Perth, Western Australia.	
13.	Astron Environmental Services. 2014. *Gorgon Project: Astron Environmental Services Barrow Island Targeted Flora Species Monitoring Program 2014 Annual Report*. Perth, Western Australia.	
14.	Astron Environmental Services. 2012. *Barrow Island Targeted Flora Species Monitoring Program – Erythrina vespertilio and Acacia bivenosa x sclerosperma subsp. sclerosperma field visit*. Perth, Western Australia.	
15.	Department of Parks and Wildlife. 2015. *Priority Ecological Communities for Western Australia: Version 22*. Perth, Western Australia.	
16.	Astron Environmental Services. 2010. *Gorgon CO_2 Injection Pipeline Flora & Vegetation Survey April 2010*. Perth, Western Australia.	
17.	Archae-aus Pty Ltd. 2009. *Preliminary Advice of Indigenous Archaeological Heritage Assessment of Proposed Extensions to the Gorgon Project Area, Barrow Island Pilbara, WA*. Perth, Western Australia.	
18.	Archae-aus Pty Ltd. 2010. *The Second Addendum to the report of an Indigenous Archaeological Heritage Assessment of Proposed Greater Gorgon Development on Barrow Island*. Perth, Western Australia.	
19.	Archae-aus Pty Ltd. 2009. *An addendum to the report of an Indigenous Archaeological Heritage Assessment of the Proposed Greater Gorgon Development on Barrow Island*. Perth, Western Australia.	

Ref. No.	Document	Document No.
20.	Wanati Pty Ltd. 2012. *Aboriginal Archaeological Assessment CO_2 Pressure Management Well Locations Barrow Island, Western Australia*. Unpublished reported prepared for Chevron Australia.	
21.	Chevron Australia. *Health, Environment, and Safety (HES) Risk Management Process*. Perth, Western Australia.	OE-03.01.01
22.	Standards Australia/Standards New Zealand. 2009. *ISO 31000:2009 Risk Management – Principles and Guidelines*. Sydney, Australia/Wellington, New Zealand.	
23.	Chevron Australia. *CO_2 Pipeline Inspection, Maintenance and Monitoring Plan*. Perth, Western Australia.	GOR-COP-0043
24.	Chevron Australia. *CO_2 System Integrated Operations Depressurisation Operating Procedure*. Perth, Western Australia.	GOR-1900-PRO-00059
25.	Chevron Australia. *Gorgon Project Carbon Dioxide Disposal Management Plan*. Perth, Western Australia.	G1-NT-REPX0001721
26.	Chevron Australia. *Barrow Island Weed Procedure User Procedure*. Perth, Western Australia.	OE-07.08.1003
27.	Chevron Australia. *Chemical Selection and Use ABU Environmental Performance Standard*. Perth, Western Australia.	OE-07.01.104
28.	Chevron Australia. 2022. Gorgon Project – Barrow Island Onshore Spill Contingency Plan. Perth, Western Australia.	GOR-COP-02978
29.	Chevron Australia. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Fauna Handling Common User Procedure*. Perth, Western Australia.	G1-PP-HES-PRC-0009
30.	Chevron Australia. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Traffic Management Common User Procedure*. Perth, Western Australia.	G1-PP-HES-PRC-0010
31.	Chevron Australia. *Marine Safety Reliability and Efficiency – ABU Standardised OE Process*. Perth, Western Australia.	OE-03.09.01
32.	Chevron Australia. *Managing Safe Work (MSW) – ABU Standardised OE Process*. Perth, Western Australia.	OE-03.06.02
33.	Chevron Australia. *Management of Change for Facilities and Operations – ABU Standardised OE Process*. Perth, Western Australia.	OE-04.00.01
34.	Chevron Australia. *Incident Investigation and Reporting – ABU Standardised OE Process*. Perth, Western Australia.	OE-09.00.01
35.	Chevron Australia. *Community and Stakeholder Engagement – ABU Standardised OE Process*. Perth, Western Australia.	OE-10.00.01
36.	Chevron Australia. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Terrestrial and Marine Quarantine Management System.* Perth, Western Australia.	GOR-COP-01854
37.	Chevron Australia. *ABU Hazardous Materials Management Procedure*. Perth, Western Australia.	OE-03.11.1045
38.	Chevron Australia. *Incident Investigation and Reporting – ABU Standardised OE Process*. Perth, Western Australia.	OE-09.00.01
39.	Chevron Australia. *ABU OE Assurance Plan*. Perth, Western Australia.	ABU161100798
40.	Chevron Australia. 2018. *ABU – OE Assurance Corporate Process*. Chevron Australia, Perth, Western Australia	OE-12.01.01
41.	Chevron Australia. 2020. *Gorgon OE Assurance Plan*. Chevron Australia, Perth, Western Australia	ABU200901265
42.	Chevron Australia. 2021. ABU Wells Source Control Contingency Plan. Perth. Western Australia	ABU130100243

Appendix A Chemical Disclosure

To meet the requirements of DMIRS *Chemical Disclosure Guideline* (2013), this Appendix details the chemicals and any chemical additives that may be introduced into the CO_2 injection and pressure management wells.

1.0 Corrosion Inhibitor

OPERATOR:	Chevron Australia PTY LTD
PROJECT / WELL:	Barrow Island CO_2 Injection Wells
SYSTEM:	CO_2 System – CO_2 with Corrosion Inhibitor – approx. 21,600 m^3

1.1 Product List Details

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
CGW24400	BHGE	Corrosion Inhibitor	~0.000112 % (20 L/day at 1.12 ppm)	Aquatic toxicity: *Skeletonema costatum* (marine algae) EC50, 72 hours: 65 mg/L *Acartia tonsa* (marine invertebrate) LC50, 48 hours: 53.4 mg/L *Cyprinodon variegatus* (marine fish) LC50, 96 hours: 92.5 mg/L Acute mammalian toxicity: Rat. LD50 (oral): 131 mg/kg Rabbit LD50 (dermal): 290 – 1000 mg/kg Chronic Toxicity: This product does carry the following H phrase: H373 - May cause damage to organs through prolonged or repeated exposure (heart and liver) Biodegradation/Bioaccumulation: Readily biodegradability	Y
Dense Phase CO_2	-	CO_2 sequestration	~ 99.999888%	-	N/A
Total			**~100%**		

[1] Assumes CO_2 injection rate of 150 kg/s at 600 kg/m^3

1.2 Chemical List

Chemicals within products in part 4.2	CAS Number	Mass Fraction (%)
CARBON DIOXIDE	124-38-9	>99.99984
WATER	7732-18-5	0.00006
THIOALCOHOL	60-24-2	0.00006
Total		**100.00**

2.0 Pressure Management System

OPERATOR:	Chevron Australia PTY LTD
PROJECT / WELL:	BWI CO2 Injection Wells
SYSTEM:	Pressure Management (PM) System – approx. 80,000 bbl/day (12,719 m^3/day)

2.1 Product List Details

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
Water	N/A	Base Fluid	~99.9	N/A	
OSW24081	BHGE	Oxygen scavenger	<0.01%	**Aquatic toxicity:** *Pseudokirchneriella subcapitata* (freshwater algae) EC50, 72 hours: 7.8 mg/L *Daphnia magna* (freshwater invertebrate) LC50, 48 hours: 9.8 mg/L *Oncorhynchus mykiss* (freshwater fish) LC50, 96 hours: 33.2 mg/L **Acute mammalian toxicity:** Rat. LD50 (oral): 1,330 mg/kg Mouse. LD50 (oral): 5,400 mg/kg **Chronic Toxicity:** This product does not carry any of the following H phrases for carcinogenic (H350, H351), chronic (H341, H370, H371, H373), mutagenic (H340) or reproductive (H360, H361, H362) effects. **Biodegradation/Bioaccumulation:** Readily biodegradability	Y
FORSA™ SCW24047 SCALE INHIBITOR	BHGE	Scale Inhibitor	<0.01%	**Aquatic toxicity:** *Skeletonema costatum* (marine algae) EC50, 72 hours: 52.3 mg/L *Acartia tonsa* (marine invertebrate) LC50, 48 hours: >1,000 mg/L *Cyprinodon variegatus* (marine fish) LC50, 96 hours: >1,000 mg/L **Acute mammalian toxicity:** Rat. LD50 (oral): 1,330 mg/kg Mouse. LD50 (oral): 5,400 mg/kg **Chronic Toxicity:** This product does not carry any of the following H phrases for carcinogenic (H350, H351), chronic (H341, H370, H371, H373), mutagenic (H340) or reproductive (H360, H361, H362) effects. **Biodegradation/Bioaccumulation:** Readily biodegradability	Y
XC24117	BHGE	Biocide	<0.01%	**Aquatic toxicity:** *Skeletonema costatum* (marine algae) EC50, 72 hours.: 0.1 mg/L *Acartia tonsa* (marine invertebrate) LC50, 48 hours: 0.3 mg/L *Cyprinodon variegatus* (marine fish) LC50, 96 hours: 1.3 mg/L **Acute mammalian toxicity:**	Y

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				Rat. LD50 (oral): 200 mg/kg **Chronic Toxicity:** No known carcinogenic (H350, H351), chronic (H341, H370, H371, H373), mutagenic (H340) or reproductive (H360, H361, H362) effects for this product. **Biodegradation/Bioaccumulation:** Readily biodegradability	
XC24302	BHGE	Biocide	<0.01%	**Aquatic toxicity:** *Skeletonema costatum* (marine algae) EC50, 72 hours: >6,400 mg/L *Acartia tonsa* (marine invertebrate) LC50, 48 hours: >1,000 mg/L *Cyprinodon variegatus* (marine fish) LC50, 96 hours: >1,000 mg/L **Acute mammalian toxicity:** Rat. LD50 (oral): 5000 mg/kg **Chronic Toxicity:** This product does not carry any of the following H phrases for carcinogenic (H350, H351), chronic (H341, H370, H371, H373), mutagenic (H340) or reproductive (H360, H361, H362) effects. **Biodegradation/Bioaccumulation:** Readily biodegradability	Y
Castrol Transaqua HT2	Castrol	Hydraulic Fluid	<0.01%	**Acute Mammalian Toxicity:** **Whole Product** Oral ATE value = 1086.9 mg/kg **Chronic Toxicity:** No known carcinogenic (R40, R45, R49), chronic (R33, R39, R48, R68), mutagenic (R46) or reproductive (R60, R61, R62, R63, R64) effects are associated with this product. **Aquatic Toxicity:** **Component 1 (30-60%)** OSPAR PLONOR Listed **Component 2 (30-60%)** OSPAR PLONOR Listed **Component 3 (0-1%)** Acartia tonsa LC50 (48h):1570 mg/L Skeletonema costatum EC50 (72h): 863 mg/L Scophthalmus maximus LC50 (96h): 1000 mg/L **Component 4 (0-1%)** Acartia tonsa LC50 (48h): 20 mg/L Skeletonema costatum EC50 (72h): 6 mg/L Scophthalmus maximus LC50 (96h): > 13.3 mg/L Corophium volutator LC50 (10d): > 151.3 mg/L **Component 5 (1-5%)** Acartia tonsa LC50 (48h): > 2000 mg/L Skeletonema costatum EC50 (72h): > 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 6 (0-1%)** Acartia tonsa LC50 (48h): > 60 mg/L Skeletonema costatum EC50 (72h): > 146 mg/L Scophthalmus maximus LC50 (96h): > 23.7 mg/L Corophium volutator LC50 (10d): > 155 mg/L **Component 7 (1-5%)**	Y

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				Acartia tonsa LC50 (48h): > 690 mg/L Skeletonema costatum EC50 (72h): > 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L Corophium volutator LC50 (10d): > 10 000 mg/L **Component 8 (0-1%)** Acartia tonsa LC50 (48h):> 241 mg/L Skeletonema costatum EC50 (72h): 14 mg/L Scophthalmus maximus LC50 (96h): > 357 mg/L **Component 9 (0-1%)** Acartia tonsa LC50 (48h): 57 mg/L Skeletonema costatum EC50 (72h): 4 mg/L Scophthalmus maximus LC50 (96h): > 218.4 mg/L **Component 10 (0-1%)** Acartia tonsa LC50 (48h): 279 mg/L Skeletonema costatum EC50 (72h): 137 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 11 (0-1%)** Acartia tonsa LC50 (48h): 104.3 mg/L Skeletonema costatum EC50 (72h): 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 12 (0-1%)** Acartia tonsa LC50 (48h): 399 mg/L Skeletonema costatum EC50 (72h): 654 mg/L Scophthalmus maximus LC50 (96h) > 1000 mg/L **Component 13 (0-1%)** Acartia tonsa LC50 (48h): 429 mg/L Skeletonema costatum EC50 (72h): 423 mg/L Scophthalmus maximus LC50 (96h): 283 mg/L **Component 14 (0-1%)** Acartia tonsa LC50 (48h): 442 mg/L Skeletonema costatum EC50 (72h): 40 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L Corophium volutator LC50 (10d): 7195 mg/L **Biodegradation / Bioaccumulation:** **Readily Biodegradability Test** **Component 1 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 2 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 3 (0-1%)** OECD 306 Biodegradability, 28 days 29.2% **Component 4 (0-1%)** OECD 306 Biodegradability, 28 days 61% **Component 5 (1-5%)** OECD 306 Biodegradability, 28 days 44% **Component 6 (0-1%)** OECD 306 Biodegradability, 28 days 75.1% **Component 7 (1-5%)** OECD 306 Biodegradability, 28 days 48% **Component 8 (0-1%)** OECD 306 Biodegradability, 28 days 67.5% **Component 9 (0-1%)** OECD 306 Biodegradability, 28 days 64.6% **Component 10 (0-1%)** OECD 306 Biodegradability, 28 days 32.9% **Component 11 (0-1%)** OECD 306 Biodegradability, 28 days 23% **Component 12 (0-1%)** Not applicable to inorganic substance **Component 13 (0-1%)** Not applicable to inorganic substance **Component 14 (0-1%)**	

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				OECD 306 Biodegradability, 28 days 30.7% Octanol/Water Partition Coefficient (OECD 117) **Component 1 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 2 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 3 (0-1%)** Log Pow = 29.2 **Component 4 (0-1%)** MW > 700 **Component 5 (1-5%)** Log Pow <0 **Component 6 (0-1%)** Log Pow <3 **Component 7 (1-5%)** Log Pow <3 **Component 8 (0-1%)** Log Pow <3 **Component 9 (0-1%)** Log Pow <0 **Component 10 (0-1%)** Log Pow <0 **Component 11 (0-1%)** Log Pow <0 **Component 12 (0-1%)** Not applicable to inorganic substance **Component 13 (0-1%)** Not applicable to inorganic substance **Component 14 (0-1%)** Log Pow >3	
Castrol Transaqua HT	Castrol	Hydraulic Fluid	<0.01%	**Acute Mammalian Toxicity:** **Whole Product** Oral ATE value = 1086.9 mg/kg **Chronic Toxicity:** No known carcinogenic (R40, R45, R49), chronic (R33, R39, R48, R68), mutagenic (R46) or reproductive (R60, R61, R62, R63, R64) effects are associated with this product. **Aquatic Toxicity:** **Component 1 (30-60%)** OSPAR PLONOR Listed **Component 2 (30-60%)** OSPAR PLONOR Listed **Component 3 (0-1%)** Acartia tonsa LC50 (48h):1570 mg/L Skeletonema costatum EC50 (72h): 863 mg/L Scophthalmus maximus LC50 (96h): 1000 mg/L **Component 4 (0-1%)** Acartia tonsa LC50 (48h): 20 mg/L Skeletonema costatum EC50 (72h): 6 mg/L Scophthalmus maximus LC50 (96h): > 13.3 mg/L Corophium volutator LC50 (10d): > 151.3 mg/L **Component 5 (1-5%)** Acartia tonsa LC50 (48h): > 2000 mg/L Skeletonema costatum EC50 (72h): > 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 6 (0-1%)** Acartia tonsa LC50 (48h): > 60 mg/L Skeletonema costatum EC50 (72h): > 146 mg/L Scophthalmus maximus LC50 (96h): > 23.7 mg/L Corophium volutator LC50 (10d): > 155 mg/L	Y

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				Component 7 (1-5%) Acartia tonsa LC50 (48h): > 690 mg/L Skeletonema costatum EC50 (72h): > 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L Corophium volutator LC50 (10d): > 10 000 mg/L **Component 8 (0-1%)** Acartia tonsa LC50 (48h):> 241 mg/L Skeletonema costatum EC50 (72h): 14 mg/L Scophthalmus maximus LC50 (96h): > 357 mg/L **Component 9 (0-1%)** Acartia tonsa LC50 (48h): 57 mg/L Skeletonema costatum EC50 (72h): 4 mg/L Scophthalmus maximus LC50 (96h): > 218.4 mg/L **Component 10 (0-1%)** Acartia tonsa LC50 (48h): 279 mg/L Skeletonema costatum EC50 (72h): 137 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 11 (0-1%)** Acartia tonsa LC50 (48h): 104.3 mg/L Skeletonema costatum EC50 (72h): 1000 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L **Component 12 (0-1%)** Acartia tonsa LC50 (48h): 399 mg/L Skeletonema costatum EC50 (72h): 654 mg/L Scophthalmus maximus LC50 (96h) > 1000 mg/L **Component 13 (0-1%)** Acartia tonsa LC50 (48h): 429 mg/L Skeletonema costatum EC50 (72h): 423 mg/L Scophthalmus maximus LC50 (96h): 283 mg/L **Component 14 (0-1%)** Acartia tonsa LC50 (48h): 442 mg/L Skeletonema costatum EC50 (72h): 40 mg/L Scophthalmus maximus LC50 (96h): > 1000 mg/L Corophium volutator LC50 (10d): 7195 mg/L **Biodegradation / Bioaccumulation:** **Readily Biodegradability Test** **Component 1 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 2 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 3 (0-1%)** OECD 306 Biodegradability, 28 days 29.2% **Component 4 (0-1%)** OECD 306 Biodegradability, 28 days 61% **Component 5 (1-5%)** OECD 306 Biodegradability, 28 days 44% **Component 6 (0-1%)** OECD 306 Biodegradability, 28 days 75.1% **Component 7 (1-5%)** OECD 306 Biodegradability, 28 days 48% **Component 8 (0-1%)** OECD 306 Biodegradability, 28 days 67.5% **Component 9 (0-1%)** OECD 306 Biodegradability, 28 days 64.6% **Component 10 (0-1%)** OECD 306 Biodegradability, 28 days 32.9% **Component 11 (0-1%)** OECD 306 Biodegradability, 28 days 23% **Component 12 (0-1%)** Not applicable to inorganic substance **Component 13 (0-1%)** Not applicable to inorganic substance	

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				Component 14 (0-1%) OECD 306 Biodegradability, 28 days 30.7% Octanol/Water Partition Coefficient (OECD 117) **Component 1 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 2 (30-60%)** Not applicable OSPAR PLONOR Listed **Component 3 (0-1%)** Log Pow = 29.2 **Component 4 (0-1%)** MW > 700 **Component 5 (1-5%)** Log Pow <0 **Component 6 (0-1%)** Log Pow <3 **Component 7 (1-5%)** Log Pow <3 **Component 8 (0-1%)** Log Pow <3 **Component 9 (0-1%)** Log Pow <0 **Component 10 (0-1%)** Log Pow <0 **Component 11 (0-1%)** Log Pow <0 **Component 12 (0-1%)** Not applicable to inorganic substance **Component 13 (0-1%)** Not applicable to inorganic substance **Component 14 (0-1%)** Log Pow >3	
Oceanic HW 740 R	MacDermid Offshore	Hydraulic Fluid	<0.01%	**Acute Toxicity:** = 5500 mg/kg LD50 Oral (Mouse) 4700 mg/kg LD50 Oral (Rat) 3500 mg/kg LD50 Dermal (Mouse) Contact with skin or eyes may cause irritation. **Chronic Toxicity:** This product does not contain any known or suspected mutagens or carcinogens. **Ecotoxicity:** **Ethanediol:** >6500 mg/l Acute EC50 Fresh water (Algae - Pseudokirchneriella subcapitata) 96 hours >1995 mg/l Acute EC50 Fresh water (Micro-organism) 30 minutes 6900000 µg/l Acute LC50 Fresh water (Crustaceans - Ceriodaphnia dubia – Neonate) 48 hours 41000000 µg/l Acute LC50 Fresh water (Daphnia - Daphnia magna – Neonate) 48 hours 8050000 µg/l Acute LC50 Fresh water (Fish - Pimephales promelas) 96 hours 15 mg/l EC50 (Algae - skeletonema costatum) 72 hours **Morpholine:** 200 mg/l LC50 (Crustaceans - acartia tonsa) 48 hours	Y

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS
				>15 mg/l Chronic LC50 (Fish - cyprinodon variegatus) 96 hours. **Biodegradation/Bioaccumulation:** Readily Biodegradability Test **Ethanediol:** Readily biodegradable. Low Potential to Bioaccumulate. **Morpholine** OECD 306 306 Biodegradability in Seawater - Inherent, 28 days, 31%	
Total			**~100%**		

2.2 Chemical List

Chemicals within products in part 3.2	CAS Number	Mass Fraction (%)
WATER	7732-18-5	99.987576
SODIUM METABISULPHITE	7681-57-4	0.0034775
ISOPROPANOL	67-63-0	0.00258922
ALKYL DIAMINE ACETATE	61791-64-8	0.00230573
GLUTARALDEHYDE	111-30-8	0.0018617
ORGANO PHOSPHONIC ACID	130668-24-5	0.00057487
DIPROPYLENE GLYCOL	25265-71-8	0.00044886
C12-16 ALKYLBENZYLDIMETHYLAMMONIUM CHLORIDE	68424-85-1	0.00032854
CITRIC ACID	77-92-9	0.00025199
SODIUM CHLORIDE	7647-14-5	0.00018664
ETHANEDIOL	107-21-1	0.00017501
MANGANESE (II) CHLORIDE	7773-01-5	0.00012348
SODIUM HYDROXIDE	1310-73-2	6.3875E-05
METHANOL	67-56-1	1.9307E-05
SODIUM BISULPHITE	7631-90-5	1.3282E-05
SODIUM SULFONATE	68608-26-4	< 0.00001
TRIETHANOLAMINE (2,2',2"-NITRILOTRIETHANOL)	102-71-6	0.00000016
MORPHOLINE	110-91-8	0.00000031
Total		**100.00**

Combined SDS

Safety Data Sheet

CGW24400 CORROSION INHIBITOR

1 . Identification of the material and supplier

Product identifier : CGW24400 CORROSION INHIBITOR

Product code : CGW24400

ADG : THIOGLYCOL SOLUTION

Product type : Liquid.

Identified uses : Corrosion inhibitor

Supplier's details : Baker Hughes, Australia
5 Walker Street,
Braeside,
Victoria 3195,
Australia

Tel: +613 9580 9004
Fax: +613 9580 6004

Emergency telephone number : CHEMTREC Emergency Telephone Numbers (Australasia Geomarket):
- Australia: (02) 9037 2994
- New Zealand: 9801 0034
- PNG: +(61) 2 9037 2994

- UK: +(44) 870-820-0418
- USA: +(1) 703-527-3887 (CHEMTREC International 24 hour)

2 . Hazards identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 3
ACUTE TOXICITY (dermal) - Category 3
ACUTE TOXICITY (inhalation) - Category 3
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
SKIN SENSITISATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (heart, liver) - Category 2
SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1

GHS label elements

Hazard pictograms :

GHS06 GHS05 GHS08 GHS09

Signal word : DANGER

Hazard statements : H301 + H311 + H331 - Toxic if swallowed, in contact with skin or if inhaled.
H318 - Causes serious eye damage.
H315 - Causes skin irritation.
H317 - May cause an allergic skin reaction.
H373 - May cause damage to organs through prolonged or repeated exposure. (heart, liver)
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Wear protective gloves: > 8 hours (breakthrough time): Nitrile or Neoprene gloves.. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapour. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace.

2 . Hazards identification

Response : Collect spillage. Get medical attention if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. IF ON SKIN: Take off immediately all contaminated clothing. Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Precautionary statements (Code) : P280, P273, P260, P304 + P340, P301 + P310, P305 + P310, P405, P501

Supplemental label elements : Not applicable.

Other hazards which do not result in classification : None known.

3 . Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
2-mercaptoethanol	30 - 60	60-24-2

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

4 . First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 15 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Move exposed person to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Skin contact : Get medical attention immediately. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 15 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

4 . First aid measures

Inhalation : Toxic if inhaled.

Skin contact : Toxic in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Toxic if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following: pain,watering,redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following: pain or irritation,redness,blistering may occur

Ingestion : Adverse symptoms may include the following: stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

5 . Firefighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst. This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,sulfur oxides

Hazchem code : 2X

6 . Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Do not breathe vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6 . Accidental release measures

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapour or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

8 . Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

Control parameters

Occupational exposure limits

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

8 . Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. Recommended: > 8 hours (breakthrough time): Nitrile or Neoprene gloves.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

9 . Physical and chemical properties

Appearance

Physical state : Liquid. [Clear.]

Colour : Colourless.

Odour : Mercaptan

Odour threshold : Not available.

pH : 4 [Conc. (% w/w): 100%]

Melting point : Not available.

Boiling point : Not available.

Flash point : Closed cup: >100°C (>212°F) [SFCC]

Evaporation rate : Not available.

Flammability (solid, gas) : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Lower and upper explosive (flammable) limits : Lower: 2.3%
Upper: 18%

Vapour pressure : Not available.

Vapour density : Not available.

Relative density : 1.0671 (15.6°C)

Solubility : Easily soluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Dynamic (4.44°C): 3.7 cP

Pour point : -33.889°C (-29°F)

10 . Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials and alkalis.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-mercaptoethanol	LC50 Inhalation Vapour	Rat	2 mg/l	4 hours
	LD50 Dermal	Rabbit	112 to 224 mg/kg	-
	LD50 Oral	Rat	131 mg/kg	-
CGW24400 CORROSION INHIBITOR	LD50 Dermal	Rat	290 to 1000 mg/kg	-

Conclusion/Summary : May be toxic if inhaled. May be toxic by skin absorption. May be toxic if ingested. Can cause target organ damage. Adverse health effects could include the following: central nervous system depression

Irritation/Corrosion

Skin : May cause skin irritation.

Eyes : Risk of serious damage to eyes. May cause eye burns and permanent eye injury.

Respiratory : No known significant effects or critical hazards.

Sensitisation

Skin : May cause sensitisation by skin contact. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Respiratory : No known significant effects or critical hazards.

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
2-mercaptoethanol	Category 2	Oral	heart and liver

Aspiration hazard

Name	Result
Not available.	

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

11 . Toxicological information

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Toxic if inhaled.

Skin contact : Toxic in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Toxic if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following: pain,watering,redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following: pain or irritation,redness,blistering may occur

Ingestion : Adverse symptoms may include the following: stomach pains

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : May cause damage to organs through prolonged or repeated exposure. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Toxicity : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Product/ingredient name	Result	Species	Exposure
2-mercaptoethanol	Acute EC50 19 mg/l Fresh water	Algae	72 hours
	Acute EC50 65 mg/l Marine water	Algae - Skeletonema costatum	72 hours
	Acute EC50 0.4 mg/l Fresh water	Daphnia	48 hours
	Acute LC50 53.4 mg/l Marine water	Crustaceans - Acartia tonsa	48 hours
	Acute LC50 37 mg/l Fresh water	Fish	96 hours
	Acute LC50 92.5 mg/l Marine water	Fish - Cyprinodon variegatus	96 hours

Persistence and degradability

Not available.

Product/ingredient name	Test	Result	Dose	Inoculum
2-mercaptoethanol	OECD 306	47 % - Not readily - 28 days	-	-

12 . Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
2-mercaptoethanol	-	-	Readily

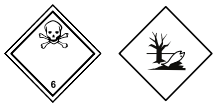
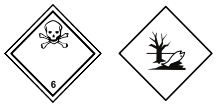
Product/ingredient name	$LogP_{ow}$	BCF	Potential
2-mercaptoethanol	-0.056	-	low

13 . Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Transport hazard class(es)	PG*	Label
ADR/RID	UN2966	THIOGLYCOL SOLUTION	6.1	II	
ADG	UN2966	THIOGLYCOL SOLUTION	6.1	II	
IMDG	UN2966	THIOGLYCOL SOLUTION	6.1	II	
IATA	UN2966	THIOGLYCOL SOLUTION	6.1	II	

PG* : Packing group

Regulatory information	Environmental hazards	Additional information
ADR/RID Class	Yes.	The environmentally hazardous substance mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Hazchem code** 2X
ADG Class	No.	**Hazchem code** 2X
IMDG Class	Yes.	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Emergency schedules** F-A S-A
IATA Class	No.	The environmentally hazardous substance mark may appear if required by other transportation regulations.

Additional information**: A • in the Hazchem code indicates that Alcohol Resistant Foam is the preferred extinguishing medium. If not available, use the extinguishing medium indicated by the number in the Hazchem code.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14 . Transport information

Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

15 . Regulatory information

Standard Uniform Schedule of Medicine and Poisons

Not regulated.

Model Work Health and Safety Regulations - Scheduled Substances

Australia inventory (AICS) : All components are listed or exempted.

References : **National Code of Practice for the Control of Workplace Hazardous Substances.**

National Code of Practice for the Labelling of Workplace Substances.
National Code of Practice for the Preparation of Material Safety Data Sheets.
Approved Criteria for Classifying Hazardous Substances.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

16 . Other information

History

Date of printing : 6 September 2018.

Date of issue/Date of revision : 6 September 2018

Date of previous issue : 5 July 2018

Version : 2

Key to abbreviations : ADG = Australian Dangerous Goods
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOHSC = National Occupational Health and Safety Commission
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

16 . Other information

Classification	Justification
Acute Tox. 3, H301	Calculation method
Acute Tox. 3, H311	On basis of test data
Acute Tox. 3, H331	Calculation method
Skin Irrit. 2, H315	Calculation method
Eye Dam. 1, H318	Calculation method
Skin Sens. 1, H317	Calculation method
STOT RE 2, H373 (heart, liver)	Calculation method
Aquatic Acute 1, H400	Calculation method
Aquatic Chronic 1, H410	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Disclaimer

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.

Safety Data Sheet

OSW24081

1 . Identification of the material and supplier

Product identifier : OSW24081

Product code : OSW24081

Product type : Liquid.

Identified uses : Oxygen scavenger.

Supplier's details : Baker Hughes, Australia
5 Walker Street,
Braeside,
Victoria 3195,
Australia

Tel: +613 9580 9004
Fax: +613 9580 6004

Emergency telephone number : CHEMTREC Emergency Telephone Numbers (Australasia Geomarket):
- Australia: (02) 9037 2994
- New Zealand: 9801 0034
- PNG: +(61) 2 9037 2994

- UK: +(44) 870-820-0418
- USA: +(1) 703-527-3887 (CHEMTREC International 24 hour)

2 . Hazards identification

Classification of the substance or mixture : SERIOUS EYE DAMAGE - Category 1

GHS label elements

Hazard pictograms :

Signal word : DANGER

Hazard statements : H318 - Causes serious eye damage.

Precautionary statements

Prevention : Wear eye or face protection.

Response : IF IN EYES: Rinse cautiously with water for several minutes. Immediately call a POISON CENTER or physician.

Storage : Not applicable.

Disposal : Not applicable.

Precautionary statements (Code) : P280, P305 + P351 + P310

Supplemental label elements : Not applicable.

Other hazards which do not result in classification : None known.

3 . Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
sodium metabisulphite	10 - 30	7681-57-4

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

4 . First-aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Skin contact : Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 15 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : pain,watering,redness

Inhalation : No specific data.

Skin contact : pain or irritation,redness,blistering may occur

Ingestion : stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

4 . First-aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

5 . Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,sulfur oxides,metal oxide/oxides

6 . Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Do not breathe vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
sodium metabisulphite	**Safe Work Australia (Australia, 1/2014).** TWA: 5 mg/m³ 8 hours.

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

8 . Exposure controls/personal protection

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

9 . Physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Pale yellow

Odour : sulfur oxides

Odour threshold : Not available.

pH : 2.8 [Conc. (% w/w): 100%]

Melting point : Not available.

Boiling point : Not available.

Flash point : Closed cup: Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapour pressure : Not available.

Vapour density : Not available.

Relative density : 1.26 (20°C)

Solubility : Easily soluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

10 . Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Reactive or incompatible with the following materials: acids and alkalis.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
sodium metabisulphite	LD50 Oral	Rat	1131 mg/kg	-

Conclusion/Summary : May be harmful if ingested. Can cause target organ damage.

11 . Toxicological information

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
sodium metabisulphite	Eyes - Mild irritant	Rabbit	-	24 hours 100 milligrams	-

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Eyes : May cause eye irritation.

Respiratory : No known significant effects or critical hazards.

Sensitisation

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Respiratory : No known significant effects or critical hazards.

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Aspiration hazard

Name	Result
Not available.	

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : pain,watering,redness

Inhalation : No specific data.

Skin contact : pain or irritation,redness,blistering may occur

Ingestion : stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

11 . Toxicological information

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Toxicity : Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Product/ingredient name	Result	Species	Exposure
sodium metabisulphite	Acute LC50 32 mg/l Fresh water	Fish - Lepomis macrochirus	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
sodium metabisulphite	-3.7	-	low

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Transport hazard class(es)	PG*	Label
ADR/RID	Not regulated.	-	-	-	
ADG	Not regulated.	-	-	-	
IMDG	Not regulated.	-	-	-	
IATA	Not regulated.	-	-	-	

14 . Transport information

PG* : Packing group

Regulatory information	Environmental hazards	Additional information
ADR/RID Class	No.	Hazchem code -
ADN Class	No.	Hazchem code -
IMDG Class	No.	-
IATA Class	No.	-

Additional information**: A • in the Hazchem code indicates that Alcohol Resistant Foam is the preferred extinguishing medium. If not available, use the extinguishing medium indicated by the number in the Hazchem code.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

15 . Regulatory information

Standard Uniform Schedule of Medicine and Poisons

Not regulated.

Model Work Health and Safety Regulations - Scheduled Substances

Australia inventory (AICS) : All components are listed or exempted.

References : **National Code of Practice for the Control of Workplace Hazardous Substances. National Code of Practice for the Labelling of Workplace Substances. National Code of Practice for the Preparation of Material Safety Data Sheets. Approved Criteria for Classifying Hazardous Substances.**

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

16 . Other information

History

Date of printing : 21 November 2016.

Date of issue/Date of revision : 21 November 2016

Date of previous issue : 27 November 2014

Version : 3

Key to abbreviations : ADG = Australian Dangerous Goods
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOHSC = National Occupational Health and Safety Commission
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

Classification	Justification
Eye Dam. 1, H318	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Disclaimer

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet

FORSA™ SCW24047 SCALE INHIBITOR

1 . Identification of the material and supplier

Product identifier : FORSA™ SCW24047 SCALE INHIBITOR

Product code : SCW24047

ADG : -

Product type : Liquid.

Identified uses : Scale Inhibitor

Supplier's details : Baker Hughes, Australia
5 Walker Street,
Braeside,
Victoria 3195,
Australia

Tel: +613 9580 9004
Fax: +613 9580 6004

Emergency telephone number : CHEMTREC Emergency Telephone Numbers (Australasia Geomarket):
- Australia: (02) 9037 2994
- New Zealand: 9801 0034
- PNG: +(61) 2 9037 2994

- UK: +(44) 870-820-0418
- USA: +(1) 703-527-3887 (CHEMTREC International 24 hour)

2 . Hazards identification

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A

GHS label elements

Hazard pictograms :

Signal word : WARNING

Hazard statements : H319 - Causes serious eye irritation.
H315 - Causes skin irritation.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Wash hands thoroughly after handling.

Response : IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : Not applicable.

Disposal : Not applicable.

Precautionary statements (Code) : P280, P264, P305 + P351 + P338

Supplemental label elements : Not applicable.

Other hazards which do not result in classification : None known.

3 . Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
Organophosphorous salt ethanediol	10 - 30 1 - 5	Trade secret. 107-21-1

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

4 . First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 15 minutes. Check for and remove any contact lenses. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 15 minutes. Get medical attention if adverse health effects persist or are severe. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : No specific data.

Skin contact : irritation,redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

5 . Firefighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,halogenated compounds,metal oxide/oxides

Hazchem code : -

6 . Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ethanediol	**Safe Work Australia (Australia, 1/2014). Absorbed through skin.** TWA: 10 mg/m³ 8 hours. Form: Particulate STEL: 104 mg/m³ 15 minutes. Form: Vapour TWA: 52 mg/m³ 8 hours. Form: Vapour TWA: 20 ppm 8 hours. Form: Vapour STEL: 40 ppm 15 minutes. Form: Vapour

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

8 . Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

9 . Physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Colourless. to Brown.

Odour : Odourless.

Odour threshold : Not available.

pH : 4 to 5.5 [Conc. (% w/w): 1% - (H2O)]

Melting point : Not available.

Boiling point : Not available.

Flash point : Closed cup: >93.4°C (>200.1°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapour pressure : Not available.

Vapour density : Not available.

Relative density : 1.15 (20°C)

Solubility : Easily soluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Kinematic (25°C): 4.9 cSt

Pour point : 0°C (32°F)

10 . Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Not available.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ethanediol	LC50 Inhalation Vapour LD50 Dermal	Rat Mouse	>2.5 mg/l >3500 mg/kg	6 hours -

Conclusion/Summary : No known significant effects or critical hazards.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
ethanediol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Mild irritant	Rabbit	-	1 hours 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	6 hours 1440 milligrams	-
	Skin - Mild irritant	Rabbit	-	555 milligrams	-

Conclusion/Summary

Skin : May cause skin irritation.

Eyes : May cause eye irritation.

Respiratory : No known significant effects or critical hazards.

Sensitisation

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Respiratory : No known significant effects or critical hazards.

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Aspiration hazard

Name	Result
Not available.	

Information on likely routes of exposure : Not available.

Potential acute health effects

11 . Toxicological information

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : pain or irritation,watering,redness

Inhalation : No specific data.

Skin contact : irritation,redness

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Toxicity : No known significant effects or critical hazards.

Product/ingredient name	Result	Species	Exposure
ethanediol; ethylene glycol	Acute EC50 6500 to 13000 mg/l Fresh water	Algae	72 hours
	Acute EC50 >100 mg/l Fresh water	Daphnia	48 hours
	Acute LC50 >100000 µg/l Marine water	Crustaceans - Crangon crangon - Adult	48 hours
	Acute LC50 10000000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 72860 mg/l Fresh water	Fish	96 hours
	Acute LC50 10000000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
ethanediol; ethylene glycol	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
ethanediol	-1.36	-	low

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Transport hazard class(es)	PG*	Label
ADR/RID	Not regulated.	-	-	-	
ADG	Not regulated.	-	-	-	
IMDG	Not regulated.	-	-	-	
IATA	Not regulated.	-	-	-	

PG* : Packing group

Regulatory information	Environmental hazards	Additional information
ADR/RID Class	No.	**Hazchem code** -
ADG Class	No.	**Hazchem code** -
IMDG Class	No.	-
IATA Class	No.	-

Additional information**: A • in the Hazchem code indicates that Alcohol Resistant Foam is the preferred extinguishing medium. If not available, use the extinguishing medium indicated by the number in the Hazchem code.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

15 . Regulatory information

Standard Uniform Schedule of Medicine and Poisons

6

Model Work Health and Safety Regulations - Scheduled Substances

Australia inventory (AICS) : All components are listed or exempted.

References : **National Code of Practice for the Control of Workplace Hazardous Substances. National Code of Practice for the Labelling of Workplace Substances. National Code of Practice for the Preparation of Material Safety Data Sheets. Approved Criteria for Classifying Hazardous Substances.**

15 . Regulatory information

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

16 . Other information

History

Date of printing : 19 April 2017.

Date of issue/Date of revision : 19 April 2017

Date of previous issue : 23 December 2016

Version : 3.01

Key to abbreviations : ADG = Australian Dangerous Goods
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOHSC = National Occupational Health and Safety Commission
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

Classification	Justification
Skin Irrit. 2, H315 Eye Irrit. 2A, H319	Calculation method Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Disclaimer

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet

XC24117

1 . Identification of the material and supplier

Product identifier : XC24117

Product code : XC24117

ADG : CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Glutaraldehyde)

Product type : Liquid.

Identified uses : Biocide.

Supplier's details : Baker Hughes, Australia
5 Walker Street,
Braeside,
Victoria 3195,
Australia

Tel: +613 9580 9004
Fax: +613 9580 6004

Emergency telephone number : CHEMTREC Emergency Telephone Numbers (Australasia Geomarket):
- Australia: (02) 9037 2994
- New Zealand: 9801 0034
- PNG: +(61) 2 9037 2994

- UK: +(44) 870-820-0418
- USA: +(1) 703-527-3887 (CHEMTREC International 24 hour)

2 . Hazards identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (inhalation) - Category 4
SKIN CORROSION/IRRITATION - Category 1B
RESPIRATORY SENSITIZATION - Category 1
SKIN SENSITIZATION - Category 1
ACUTE AQUATIC HAZARD - Category 2

GHS label elements

Hazard pictograms :

Signal word : DANGER

Hazard statements : H302 + H332 - Harmful if swallowed or if inhaled.
H314 - Causes severe skin burns and eye damage.
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317 - May cause an allergic skin reaction.
H401 - Toxic to aquatic life.

Precautionary statements

Prevention : Wear protective gloves: > 8 hours (breakthrough time): Butyl rubber gloves. Nitrile rubber gloves.. Wear eye or face protection. Wear protective clothing. Avoid release to the environment.

Response : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a POISON CENTER or physician. IF IN EYES: Immediately call a POISON CENTER or physician.

Storage : Store locked up.

2 . Hazards identification

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Precautionary statements (Code) : P280, P273, P304 + P340 + P310, P301 + P310 + P331, P303 + P361 + P353 + P310, P305 + P310, P405, P501

Supplemental label elements : Not applicable.

Other hazards which do not result in classification : None known.

3 . Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
glutaral Quaternary ammonium compounds, benzyl-C12-14-alkyldimethyl, chlorides	10 - 30 1 - 5	111-30-8 .68424-85-1 (outside EU)

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

4 . First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Chemical burns must be treated promptly by a physician.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. In the event of any complaints or symptoms, avoid further exposure.

Skin contact : Get medical attention immediately. Call a poison center or physician. Wash affected area with soap and mild detergent for at least 20 - 60 minutes. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Call a poison center or physician. Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes severe burns. May cause an allergic skin reaction.

Ingestion : Harmful if swallowed.

4 . First aid measures

Over-exposure signs/symptoms

Eye contact : pain,watering,redness

Inhalation : wheezing and breathing difficulties,asthma

Skin contact : pain or irritation,redness,blistering may occur

Ingestion : stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

5 . Firefighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst. This material is toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Hazchem code : 2X

6 . Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Do not breathe vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

6 . Accidental release measures

Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitisation problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapour or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
glutaral	**Safe Work Australia (Australia, 1/2014). Skin sensitiser.** TWA: 0.1 ppm 8 hours. TWA: 0.41 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

8 . Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. Recommended: > 8 hours (breakthrough time): Butyl rubber gloves. Nitrile rubber gloves.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

9 . Physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Clear. / Colourless.

Odour : Fruity. Medicinal product [Strong]

Odour threshold : Not available.

pH : 4 to 6 [Conc. (% w/w): 10% - (H2O)]

Melting point : Not available.

Boiling point : Not available.

Flash point : Closed cup: Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapour pressure : Not available.

Vapour density : Not available.

9 . Physical and chemical properties

Relative density : 1.033 to 1.053 (20°C)

Solubility : Soluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

10 . Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
glutaral	LD50 Dermal LD50 Oral	Rabbit Rat	1749 mg/kg 200 mg/kg	- -
Quaternary ammonium compounds, benzyl-C12-14-alkyldimethyl, chlorides	LD50 Oral	Rat	426 mg/kg	-

Conclusion/Summary : Harmful if inhaled. May be harmful if ingested. Can cause target organ damage. Adverse health effects could include the following: central nervous system depression

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
glutaral	Eyes - Severe irritant	Rabbit	-	24 hours 250 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	1 milligrams	-
	Skin - Severe irritant	Human	-	72 hours 6 milligrams Intermittent	-
	Skin - Mild irritant	Rabbit	-	13 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 2 milligrams	-
Quaternary ammonium compounds, benzyl-C12-14-alkyldimethyl, chlorides	Skin - Severe irritant	Rabbit	-	25 milligrams	-

Conclusion/Summary

Skin : Causes pain and burns in contact with skin. May cause permanent skin damage.

Eyes : Risk of serious damage to eyes. May cause eye burns and permanent eye injury.

Respiratory : No known significant effects or critical hazards.

Sensitisation

Conclusion/Summary

11 . Toxicological information

Skin : May cause sensitisation by skin contact. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Respiratory : May cause sensitisation by inhalation. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Aspiration hazard

Name	Result
Not available.	

Information on likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes severe burns. May cause an allergic skin reaction.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : pain,watering,redness

Inhalation : wheezing and breathing difficulties,asthma

Skin contact : pain or irritation,redness,blistering may occur

Ingestion : stomach pains

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

11 . Toxicological information

Potential chronic health effects

General : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Toxicity : Toxic to aquatic organisms. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Product/ingredient name	Result	Species	Exposure
glutaral; 1,5-pentanedial	Acute EC50 0.61 mg/l Acute EC50 0.69 mg/l Acute LC50 13 mg/l	Algae Daphnia Fish	72 hours 48 hours 96 hours

Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
glutaral; 1,5-pentanedial	-	90 to 100 % - Readily - 28 days	-	-

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
glutaral; 1,5-pentanedial Quaternary ammonium compounds, benzyl-C12-14-alkyldimethyl, chlorides	- -	- -	Readily Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
glutaral	-0.36	-	low

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

International transport regulations

14 . Transport information

Regulatory information	UN number	Proper shipping name	Transport hazard class(es)	PG*	Label
ADR/RID	UN3265	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Glutaraldehyde)	8	III	
ADG	UN3265	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Glutaraldehyde)	8	III	
IMDG	UN3265	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Glutaraldehyde)	8	III	
IATA	UN3265	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Glutaraldehyde)	8	III	

PG* : Packing group

Regulatory information	Environmental hazards	Additional information**
ADR/RID Class	No.	**Hazchem code** 2X
ADG Class	No.	**Hazchem code** 2X
IMDG Class	No.	-
IATA Class	No.	-

Additional information**: A • in the Hazchem code indicates that Alcohol Resistant Foam is the preferred extinguishing medium. If not available, use the extinguishing medium indicated by the number in the Hazchem code.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

15 . Regulatory information

Standard Uniform Schedule of Medicine and Poisons

6

Model Work Health and Safety Regulations - Scheduled Substances

Ingredient name	Schedule
methanol	Restricted hazardous chemical [For spray painting if the substance contains more than 1% by volume]

Australia inventory (AICS) : All components are listed or exempted.

15 . Regulatory information

References : **National Code of Practice for the Control of Workplace Hazardous Substances. National Code of Practice for the Labelling of Workplace Substances. National Code of Practice for the Preparation of Material Safety Data Sheets. Approved Criteria for Classifying Hazardous Substances.**

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

16 . Other information

History

Date of printing : 13 November 2017.

Date of issue/Date of revision : 13 November 2017

Date of previous issue : 1 January 2017

Version : 5

Key to abbreviations : ADG = Australian Dangerous Goods
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOHSC = National Occupational Health and Safety Commission
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

Classification	Justification
Acute Tox. 4, H302	Calculation method
Acute Tox. 4, H332	Calculation method
Skin Corr. 1B, H314	Calculation method
Resp. Sens. 1, H334	Calculation method
Skin Sens. 1, H317	Calculation method
Aquatic Acute 2, H401	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Disclaimer

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet

XC24302

1 . Identification of the material and supplier

Product identifier : XC24302

Product code : XC24302

ADG : FLAMMABLE LIQUID, CORROSIVE, N.O.S. (contains isopropanol)

Product type : Liquid.

Identified uses : Biocide.

Supplier's details : Baker Hughes, Australia
5 Walker Street,
Braeside,
Victoria 3195,
Australia

Tel: +613 9580 9004
Fax: +613 9580 6004

Emergency telephone number : CHEMTREC Emergency Telephone Numbers (Australasia Geomarket):
- Australia: (02) 9037 2994
- New Zealand: 9801 0034
- PNG: +(61) 2 9037 2994

- UK: +(44) 870-820-0418
- USA: +(1) 703-527-3887 (CHEMTREC International 24 hour)

2 . Hazards identification

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
ACUTE AQUATIC HAZARD - Category 2

GHS label elements

Hazard pictograms :

Signal word : WARNING

Hazard statements : H226 - Flammable liquid and vapour.
H319 - Causes serious eye irritation.
H315 - Causes skin irritation.
H336 - May cause drowsiness or dizziness.
H401 - Toxic to aquatic life.

Precautionary statements

Prevention : Wear protective gloves: > 8 hours (breakthrough time): Rubber gloves. Nitrile gloves. Neoprene gloves.. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Avoid release to the environment.

Response : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.

Storage : Keep cool.

2 . Hazards identification

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Precautionary statements (Code) : P280, P210, P241, P273, P304 + P340, P303 + P361 + P353, P235, P501

Supplemental label elements : Not applicable.

Other hazards which do not result in classification : None known.

3 . Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
Isopropyl alcohol	10 - 30	67-63-0
Alkyl diamine acetate	10 - 30	Trade secret.
oxydipropanol	1 - 5	25265-71-8

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

4 . First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 15 minutes. Check for and remove any contact lenses. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 15 minutes. Get medical attention if adverse health effects persist or are severe. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : nausea or vomiting,headache,drowsiness/fatigue,dizziness/vertigo,unconsciousness

Skin contact : irritation,redness

4 . First aid measures

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

5 . Firefighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapour. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard. This material is toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Hazchem code : •3Y

6 . Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and material for containment and cleaning up

6 . Accidental release measures

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isopropyl alcohol	**Safe Work Australia (Australia, 1/2014).** STEL: 1230 mg/m³ 15 minutes. STEL: 500 ppm 15 minutes. TWA: 983 mg/m³ 8 hours. TWA: 400 ppm 8 hours.
oxydipropanol	**TRGS900 AGW (Germany, 6/2016). Absorbed through skin.** TWA: 100 mg/m³ 8 hours. Form: Inhalable

8 . Exposure controls/personal protection

	fraction PEAK: 200 mg/m³ 15 minutes. Form: Inhalable fraction

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. Recommended: > 8 hours (breakthrough time): Rubber gloves. Nitrile gloves. Neoprene gloves.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

9 . Physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Colourless to light yellow.

Odour : Alcohol-like.

Odour threshold : Not available.

pH : 5.5 to 6.5

Melting point : -34°C (-29.2°F)

Boiling point : Not available.

9 . Physical and chemical properties

Flash point : Closed cup: 24°C (75.2°F) [Pensky-Martens.]

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapour pressure : Not available.

Vapour density : Not available.

Relative density : 0.945 (20°C)

Solubility : Easily soluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

10 . Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Not available.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isopropyl alcohol	LD50 Oral	Rat	5000 mg/kg	-
	LD50 Oral	Rat	5045 mg/kg	-
oxydipropanol	LD50 Oral	Rat	14850 mg/kg	-

Conclusion/Summary : No known significant effects or critical hazards.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Isopropyl alcohol	Eyes - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	10 milligrams	-
	Eyes - Severe irritant	Rabbit	-	100 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-

Conclusion/Summary

Skin : May cause skin irritation.

Eyes : May cause eye irritation.

Respiratory : No known significant effects or critical hazards.

Sensitisation

Conclusion/Summary

Skin : No known significant effects or critical hazards.

Respiratory : No known significant effects or critical hazards.

11 . Toxicological information

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Isopropyl alcohol	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Not available.			

Aspiration hazard

Name	Result
Not available.	

Information on likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : pain or irritation,watering,redness

Inhalation : nausea or vomiting,headache,drowsiness/fatigue,dizziness/vertigo,unconsciousness

Skin contact : irritation,redness

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

11 . Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Toxicity : Toxic to aquatic organisms.

Product/ingredient name	Result	Species	Exposure
propan-2-ol; isopropanol	Acute LC50 9714 mg/l Fresh water Acute LC50 9640 mg/l Fresh water	Daphnia Fish	24 hours 96 hours
Alkyl diamine acetate	Acute EC50 104 ppb Fresh water Acute LC50 577 ppb Marine water	Daphnia - Daphnia magna Fish - Menidia menidia	48 hours 96 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
propan-2-ol; isopropanol	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isopropyl alcohol oxydipropanol	0.05 -0.462	- 0.3 to 4.6	low low

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Vapour from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Transport hazard class(es)	PG*	Label
ADR/RID	UN1993	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (contains isopropanol)	3	III	
ADG	UN1993	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (contains isopropanol)	3	III	
IMDG	UN1993	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (contains isopropanol)	3	III	

14 . Transport information

IATA	UN1993	FLAMMABLE LIQUID, CORROSIVE, N.O.S. (contains isopropanol)	3	III	

PG* : Packing group

Regulatory information	Environmental hazards	Additional information**
ADR/RID Class	No.	**Special provisions** 640 (E) **Tunnel code** (D/E) **Hazchem code** 3Y
ADG Class	No.	**Hazchem code** •3Y
IMDG Class	No.	-
IATA Class	No.	-

Additional information**: A • in the Hazchem code indicates that Alcohol Resistant Foam is the preferred extinguishing medium. If not available, use the extinguishing medium indicated by the number in the Hazchem code.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

15 . Regulatory information

Standard Uniform Schedule of Medicine and Poisons

Not regulated.

Model Work Health and Safety Regulations - Scheduled Substances

Australia inventory (AICS) : All components are listed or exempted.

References : **National Code of Practice for the Control of Workplace Hazardous Substances. National Code of Practice for the Labelling of Workplace Substances. National Code of Practice for the Preparation of Material Safety Data Sheets. Approved Criteria for Classifying Hazardous Substances.**

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

15 . Regulatory information

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

16 . Other information

History

Date of printing : 27 July 2017.

Date of issue/Date of revision : 27 July 2017

Date of previous issue : 29 April 2013

Version : 2

Key to abbreviations :
ADG = Australian Dangerous Goods
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOHSC = National Occupational Health and Safety Commission
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

Classification	Justification
Flam. Liq. 3, H226	On basis of test data
Skin Irrit. 2, H315	Calculation method
Eye Irrit. 2A, H319	Calculation method
STOT SE 3, H336	Calculation method
Aquatic Acute 2, H401	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Disclaimer

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Transaqua HT2

Section 1. Identification

GHS product identifier Transaqua HT2

Product code 462602-AU24

SDS no. 462602

Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/ mixture Hydraulic fluid
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Manufacturer

Supplier

Castrol Australia Pty Ltd
Level 17, 717 Bourke Street
Docklands, Victoria 3008
ABN 87 008 459 407
www.castrol.com.au

Tel: +61 (03) 9268 4111

EMERGENCY TELEPHONE NUMBER +61 2801 44558 (or 1800 14 14 74 within Australia)

OTHER PRODUCT INFORMATION Technical Advice Helpline Number: 1300 557 998

Section 2. Hazard(s) identification

Classification of the substance or mixture
ACUTE TOXICITY (oral) - Category 4
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2

GHS label elements

Hazard pictograms

Signal word WARNING

Hazard statements
H302 - Harmful if swallowed.
H373 - May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention
P260 - Do not breathe vapour.
P270 - Do not eat, drink or smoke when using this product.
P264 - Wash hands thoroughly after handling.

Response
P301 + P312, P330 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell. Rinse mouth.

Storage Not applicable.

Disposal P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements Not applicable.

Section 2. Hazard(s) identification

Other hazards which do not result in classification

Note: High Pressure Applications
Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency.
See 'Notes to physician' under First-Aid Measures, Section 4 of this Safety Data Sheet.

Section 3. Composition and ingredient information

Substance/mixture Mixture

Ethylene glycol; ethanediol. Proprietary performance additives.

Ingredient name	% (w/w)	CAS number
Ethylene glycol	≥30 - ≤60	107-21-1
2,2',2''-nitrilotriethanol	≤5	102-71-6

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention if symptoms occur.

Inhalation

If inhaled, remove to fresh air. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. Get medical attention if symptoms occur.

Skin contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if symptoms occur.

Ingestion

If ingested, call a physician or Poison Control Center immediately. Get medical attention urgently informing the doctor that a product containing ethylene glycol has been ingested and specific treatment may be required. Transport casualty together with the product container, its label, or the safety data sheet urgently to hospital. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately.

Most important symptoms/effects, acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician

In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Note: High Pressure Applications
Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discoloured and extremely painful with extensive subcutaneous necrosis.
Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimise tissue loss and prevent or limit permanent damage. Note that high pressure may force the product considerable distances along tissue planes.

Specific treatments

Ethylene Glycol: Gastric irrigation, ethanol or fomepizole may have value in treatment. Consult physician.

Section 4. First aid measures

Protection of first-aiders — No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Section 5. Firefighting measures

Extinguishing media

Suitable extinguishing media — In case of fire, use water fog, alcohol resistant foam, dry chemical or carbon dioxide extinguisher or spray.

Unsuitable extinguishing media — Do not use water jet.

Specific hazards arising from the chemical — In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products — Combustion products may include the following:
carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
nitrogen oxides (NO, NO_2 etc.)

Special protective actions for fire-fighters — No action shall be taken involving any personal risk or without suitable training. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire.

Special protective equipment for fire-fighters — Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel — Contact emergency personnel. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling.

For emergency responders — Entry into a confined space or poorly ventilated area contaminated with vapour, mist or fume is extremely hazardous without the correct respiratory protective equipment and a safe system of work. Wear self-contained breathing apparatus. Wear a suitable chemical protective suit. Chemical resistant boots. See also the information in "For non-emergency personnel".

Environmental precautions — Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and material for containment and cleaning up

Small spill — Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill — Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Contaminated absorbent material may pose the same hazard as the spilt product. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

Precautions for safe handling

Protective measures

Put on appropriate personal protective equipment (see Section 8). Do not breathe vapour or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Store and use only in equipment/containers designed for use with this product. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. DO NOT ADD NITRITES TO THIS FLUID.

Not suitable

Prolonged exposure to elevated temperature

Section 8. Exposure controls and personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Ethylene glycol	**Safe Work Australia (Australia). Absorbed through skin.** TWA: 10 mg/m³ 8 hours. Issued/Revised: 8/2005 Form: Particulate STEL: 104 mg/m³ 15 minutes. Issued/Revised: 8/2005 Form: Vapour TWA: 52 mg/m³ 8 hours. Issued/Revised: 8/2005 Form: Vapour TWA: 20 ppm 8 hours. Issued/Revised: 8/2005 Form: Vapour STEL: 40 ppm 15 minutes. Issued/Revised: 8/2005 Form: Vapour
2,2',2''-nitrilotriethanol	**Safe Work Australia (Australia). Skin sensitiser.** TWA: 5 mg/m³ 8 hours. Issued/Revised: 4/1997

Appropriate engineering controls

All activities involving chemicals should be assessed for their risks to health, to ensure exposures are adequately controlled. Personal protective equipment should only be considered after other forms of control measures (e.g. engineering controls) have been suitably evaluated. Personal protective equipment should conform to appropriate standards, be suitable for use, be kept in good condition and properly maintained.
Your supplier of personal protective equipment should be consulted for advice on selection and appropriate standards. For further information contact your national organisation for standards.
Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.
The final choice of protective equipment will depend upon a risk assessment. It is important to ensure that all items of personal protective equipment are compatible.

Section 8. Exposure controls and personal protection

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety glasses with side shields.

Skin protection

Hand protection

Wear protective gloves if prolonged or repeated contact is likely. Wear chemical resistant gloves. Recommended: Butyl gloves. Neoprene gloves. The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Skin protection

Use of protective clothing is good industrial practice.
Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Cotton or polyester/cotton overalls will only provide protection against light superficial contamination that will not soak through to the skin. Overalls should be laundered on a regular basis. When the risk of skin exposure is high (e.g. when cleaning up spillages or if there is a risk of splashing) then chemical resistant aprons and/or impervious chemical suits and boots will be required.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment.
The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. Safety procedures should be developed for each intended application. Respiratory protection equipment should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Refer to standards:

Respiratory protection:AS/NZS 1715 and AS/NZS 1716
Gloves:AS/NZS 2161.1
Eye protection:AS/NZS 1336 and AS/NZS 1337

Section 9. Physical and chemical properties

Appearance

Physical state Liquid.

Colour Brown. [Light]

Odour Not available.

Odour threshold Not available.

pH 8.7 to 9

Melting point Not available.

Boiling point 100°C (212°F)

Flash point Closed cup: Not applicable. [Water content interferes with flash point determination.]

Evaporation rate Not available.

Section 9. Physical and chemical properties

Flammability (solid, gas)	Not applicable. Based on - Physical state
Lower and upper explosive (flammable) limits	Not available.
Vapour pressure	Not available.
Vapour density	Not available.
Relative density	Not available.
Density	>1000 kg/m³ (>1 g/cm³) at 15°C
Solubility	Miscible in water.
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Kinematic: 2.1 to 2.5 mm^2/s (2.1 to 2.5 cSt) at 40°C

Section 10. Stability and reactivity

Reactivity	No specific test data available for this product. Refer to Conditions to avoid and Incompatible materials for additional information.
Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerisation will not occur.
Conditions to avoid	Avoid excessive heat.
Incompatible materials	Reactive or incompatible with the following materials: oxidising materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Ethylene glycol	Category 2	-	-

Information on likely routes of exposure Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact	No known significant effects or critical hazards.
Inhalation	Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Skin contact	No known significant effects or critical hazards.
Ingestion	Harmful if swallowed. Ethylene glycol: Ingestion of ethylene glycol can cause metabolic acidosis, kidney damage, central nervous system depression, and convulsions. The estimated human lethal dose is approximately 100 ml (3.4 ounces for an adult).

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact	No specific data.
Inhalation	May be harmful by inhalation if exposure to vapour, mists or fumes resulting from thermal decomposition products occurs.
Skin contact	No specific data.

Section 11. Toxicological information

Ingestion Adverse symptoms may include the following:
nausea or vomiting

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Eye contact Potential risk of transient stinging or redness if accidental eye contact occurs.

Skin contact Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

General May cause damage to organs through prolonged or repeated exposure. (kidney)

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects Birth defects and decreased fetal weight have been observed in laboratory animals fed ethylene glycol in large amounts repeatedly during pregnancy.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	1092.78 mg/kg

Section 12. Ecological information

Persistence and degradability

Expected to be biodegradable.

Bioaccumulative potential

This product is not expected to bioaccumulate through food chains in the environment.

Mobility in soil

Soil/water partition coefficient (K_{OC}) Not available.

Mobility Spillages may penetrate the soil causing ground water contamination.

Other ecological information Miscible in water.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Diluted fluid should not be discharged into sewage systems unless provided for by local

Section 13. Disposal considerations

regulations. Dispose under conditions approved by the local authority or via a licensed waste disposal contractor.

Special Precautions for Landfill or Incineration No additional special precautions identified.

Section 14. Transport information

	ADG	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-
Transport hazard class(es)	-	-	-
Packing group	-	-	-
Environmental hazards	No.	No.	No.
Additional information	-	-	-

Special precautions for user Not available.

Section 15. Regulatory information

Standard for the Uniform Scheduling of Medicines and Poisons

6

Consumer products - This material is a scheduled poison and must be stored, maintained and used in accordance with the relevant regulations. Industrial Products - Labelling requirements for SUSMP do not apply to a poison that is packed and sold solely for industrial, laboratory or manufacturing use. However, this product is labelled in accordance with NOSHC National Code of Practice for labelling of workplace substances.

Model Work Health and Safety Regulations - Scheduled Substances

No listed substance

Montreal Protocol

Ingredient name	List name	Status
Not listed.		

Stockholm Convention on Persistent Organic Pollutants

Ingredient name	List name	Status
Not listed.		

Rotterdam Convention on Prior Informed Consent (PIC)

Ingredient name	List name	Status
Not listed.		

International lists

National inventory

REACH Status For the REACH status of this product please consult your company contact, as identified in Section 1.

Australia inventory (AICS) All components are listed or exempted.

Section 15. Regulatory information

Canada inventory	At least one component is not listed in DSL but all such components are listed in NDSL.
China inventory (IECSC)	At least one component is not listed.
Japan inventory (ENCS)	At least one component is not listed.
Korea inventory (KECI)	At least one component is not listed.
Philippines inventory (PICCS)	At least one component is not listed.
Taiwan Chemical Substances Inventory (TCSI)	At least one component is not listed.
United States inventory (TSCA 8b)	Not determined.

Section 16. Any other relevant information

History

Date of printing	8/25/2021
Date of issue/Date of revision	8/25/2021
Date of previous issue	9/12/2019
Version	4
Prepared by	Product Stewardship
Key to abbreviations	ADG = Australian Dangerous Goods ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) NOHSC = National Occupational Health and Safety Commission REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation [Regulation (EC) No. 1907/2006] STEL = Short term exposure limit SUSMP = Standard Uniform Schedule of Medicine and Poisons UN = United Nations TWA = Time weighted average VOC = Volatile Organic Compound SADT = Self-Accelerating Decomposition Temperature Varies = may contain one or more of the following 64741-88-4, 64741-89-5, 64741-95-3, 64741-96-4, 64742-01-4, 64742-44-5, 64742-45-6, 64742-52-5, 64742-53-6, 64742-54-7, 64742-55-8, 64742-56-9, 64742-57-0, 64742-58-1, 64742-62-7, 64742-63-8, 64742-65-0, 64742-70-7, 72623-85-9, 72623-86-0, 72623-87-1

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 4	Calculation method
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2	Calculation method

Indicates information that has changed from previously issued version.

Notice to reader

Section 16. Any other relevant information

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

SAFETY DATA SHEET

Transaqua HT

Section 1. Identification

GHS product identifier Transaqua HT

Product type Liquid.

Product code 453721-FR01

SDS no. 453721

Relevant identified uses of the substance or mixture and uses advised against

Product use Fire-resistant hydraulic fluid.
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Supplier BP Singapore Pte. Limited (196600436K)
7 Straits View
Marina One East Tower
#26-01, Singapore 018936

Tel: +65-6335 3000

EMERGENCY TELEPHONE NUMBER Carechem: +65 3158 1074 (24/7)

Section 2. Hazards identification

Classification of the substance or mixture ACUTE TOXICITY (oral) - Category 4
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (kidneys) - Category 2

GHS label elements

Hazard pictograms

Signal word Warning

Hazard statements H302 - Harmful if swallowed.
H373 - May cause damage to organs through prolonged or repeated exposure. (kidneys)

Precautionary statements

Prevention P260 - Do not breathe vapour.
P270 - Do not eat, drink or smoke when using this product.
P264 - Wash hands thoroughly after handling.

Response P314 - Get medical attention if you feel unwell.
P301 + P312 + P330 - IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth.

Storage Not applicable.

Disposal P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 2. Hazards identification

Other hazards which do not result in classification

Defatting to the skin.
Note: High Pressure Applications
Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency.
See 'Notes to physician' under First-Aid Measures, Section 4 of this Safety Data Sheet.

Section 3. Composition/information on ingredients

Substance/mixture Mixture

Ethylene glycol; ethanediol. Proprietary performance additives.

Ingredient name	%	CAS number
Ethylene glycol	≥25 - ≤50	107-21-1
2,2',2''-nitrilotriethanol	≤5	102-71-6

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention.

Inhalation

In case of inhalation of decomposition products in a fire, symptoms may be delayed. If inhaled, remove to fresh air. The exposed person may need to be kept under medical surveillance for 48 hours. Get medical attention if symptoms occur.

Skin contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if symptoms occur.

Ingestion

If ingested, call a physician or Poison Control Center immediately. Get medical attention urgently informing the doctor that a product containing ethylene glycol has been ingested and specific treatment may be required. Transport casualty together with the product container, its label, or the safety data sheet urgently to hospital. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately.

Most important symptoms/effects, acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician

In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Note: High Pressure Applications
Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discoloured and extremely painful with extensive subcutaneous necrosis.
Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimise tissue loss and prevent or limit permanent damage. Note that high pressure may force the

Section 4. First aid measures

product considerable distances along tissue planes.

Specific treatments — Ethylene Glycol: Gastric irrigation, ethanol or fomepizole may have value in treatment. Consult physician.

Protection of first-aiders — No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Section 5. Firefighting measures

Extinguishing media

Suitable extinguishing media — In case of fire, use water fog, alcohol resistant foam, dry chemical or carbon dioxide extinguisher or spray.

Unsuitable extinguishing media — Do not use water jet.

Specific hazards arising from the chemical — In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products — Combustion products may include the following:
carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
nitrogen oxides (NO, NO_2 etc.)

Special protective actions for fire-fighters — Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters — Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel — No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling. Contact emergency personnel.

For emergency responders — Entry into a confined space or poorly ventilated area contaminated with vapour, mist or fume is extremely hazardous without the correct respiratory protective equipment and a safe system of work. Wear self-contained breathing apparatus. Wear a suitable chemical protective suit. Chemical resistant boots. See also the information in "For non-emergency personnel".

Environmental precautions — Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and material for containment and cleaning up

Small spill — Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Section 6. Accidental release measures

Large spill

Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Contaminated absorbent material may pose the same hazard as the spilt product. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

Precautions for safe handling

Protective measures

Put on appropriate personal protective equipment (see Section 8). Do not breathe vapour or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Store and use only in equipment/containers designed for use with this product. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. DO NOT ADD NITRITES TO THIS FLUID.

Not suitable

Prolonged exposure to elevated temperature.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Ethylene glycol	**Workplace Safety and Health Act (Singapore).** PEL (short term): 127 mg/m³ 15 minutes. Issued/Revised: 1/1997 PEL (short term): 50 ppm 15 minutes. Issued/Revised: 1/1997
2,2',2"-nitrilotriethanol	**Workplace Safety and Health Act (Singapore).** PEL (long term): 5 mg/m³ 8 hours. Issued/Revised: 1/1997

Recommended monitoring procedures

If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

Appropriate engineering controls

Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.
All activities involving chemicals should be assessed for their risks to health, to ensure exposures are adequately controlled. Personal protective equipment should only be considered after other forms of control measures (e.g. engineering controls) have been suitably evaluated. Personal protective equipment should conform to appropriate standards, be suitable for use, be kept in good condition and properly

Section 8. Exposure controls/personal protection

maintained.
Your supplier of personal protective equipment should be consulted for advice on selection and appropriate standards. For further information contact your national organisation for standards.
The final choice of protective equipment will depend upon a risk assessment. It is important to ensure that all items of personal protective equipment are compatible.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety glasses with side shields.

Skin protection

Hand protection

Wear protective gloves if prolonged or repeated contact is likely. Wear chemical resistant gloves. Recommended: Butyl gloves. Neoprene gloves. The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Skin protection

Use of protective clothing is good industrial practice.
Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Cotton or polyester/cotton overalls will only provide protection against light superficial contamination that will not soak through to the skin. Overalls should be laundered on a regular basis. When the risk of skin exposure is high (e.g. when cleaning up spillages or if there is a risk of splashing) then chemical resistant aprons and/or impervious chemical suits and boots will be required.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment.
The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. Safety procedures should be developed for each intended application. Respiratory protection equipment should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Section 9. Physical and chemical properties

Appearance

Physical state Liquid.

Colour Yellow. [Light]

Odour Not available.

Odour threshold Not available.

pH 8.8 [Conc. (% w/w): 100%]

Melting point Not available.

Boiling point Not available.

Flash point Closed cup: Not applicable. [Water content interferes with flash point determination.]

Section 9. Physical and chemical properties

Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable. Based on - Physical state
Lower and upper explosive (flammable) limits	Not available.
Vapour pressure	Not available.
Vapour density	Not available.
Relative density	Not available.
Density	>1000 kg/m³ (>1 g/cm³) at 15°C
Solubility	Soluble in water.
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Kinematic: 2.3 mm^2/s (2.3 cSt) at 40°C

Section 10. Stability and reactivity

Reactivity	No specific test data available for this product. Refer to Conditions to avoid and Incompatible materials for additional information.
Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerisation will not occur.
Conditions to avoid	Avoid excessive heat.
Incompatible materials	Reactive or incompatible with the following materials: oxidising materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Ethylene glycol	Category 2	Oral	kidneys

Information on likely routes of exposure	Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact	No known significant effects or critical hazards.
Inhalation	Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Skin contact	Defatting to the skin. May cause skin dryness and irritation.

Section 11. Toxicological information

Ingestion Harmful if swallowed. Ethylene glycol: Ingestion of ethylene glycol can cause metabolic acidosis, kidney damage, central nervous system depression, and convulsions. The estimated human lethal dose is approximately 100 ml (3.4 ounces for an adult).

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact No specific data.

Inhalation May be harmful by inhalation if exposure to vapour, mists or fumes resulting from thermal decomposition products occurs.

Skin contact Adverse symptoms may include the following:
irritation
dryness
cracking

Ingestion Adverse symptoms may include the following:
nausea or vomiting

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Eye contact Potential risk of transient stinging or redness if accidental eye contact occurs.

Skin contact Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Potential chronic health effects

General May cause damage to organs through prolonged or repeated exposure. (kidney)

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects Birth defects and decreased fetal weight have been observed in laboratory animals fed ethylene glycol in large amounts repeatedly during pregnancy.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	1087 mg/kg

Section 12. Ecological information

Toxicity

Environmental effects No known significant effects or critical hazards.

Persistence/degradability

Expected to be biodegradable.

Bioaccumulative potential

This product is not expected to bioaccumulate through food chains in the environment.

Mobility in soil

Soil/water partition coefficient (K_{OC}) Not available.

Mobility Spillages may penetrate the soil causing ground water contamination.

Section 12. Ecological information

Other ecological information Miscible in water.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Diluted Fluid Diluted fluid should not be discharged into sewage systems unless provided for by local regulations. Dispose under conditions approved by the local authority or via a licensed waste disposal contractor.

Section 14. Transport information

	ADR/RID	ADN	IMDG	IATA/ICAO
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

Special precautions for user Not available.

Section 15. Regulatory information

Safety, health and environmental regulations specific for the product No known specific national and/or regional regulations applicable to this product (including its ingredients).

Regulation according to other foreign laws

REACH Status The company, as identified in Section 1, sells this product in the EU in compliance with the current requirements of REACH.

United States inventory (TSCA 8b) All components are listed or exempted.

Australia inventory (AICS) All components are listed or exempted.

Section 15. Regulatory information

Canada inventory	At least one component is not listed in DSL but all such components are listed in NDSL.
China inventory (IECSC)	At least one component is not listed.
Japan inventory (ENCS)	At least one component is not listed.
Korea inventory (KECI)	At least one component is not listed.
Philippines inventory (PICCS)	At least one component is not listed.
Taiwan Chemical Substances Inventory (TCSI)	At least one component is not listed.

Section 16. Other information

History

Date of issue/Date of revision	2018 November 21
Date of previous issue	2018 October 23
Version	5
Prepared by	Product Stewardship
Key to abbreviations	ACGIH = American Conference of Industrial Hygienists CAS Number = Chemical Abstracts Service Registry Number GHS = Global Harmonised System IATA = International Air Transport Association, the organisation IMDG = International Maritime Organization Rules, rules governing shipment of goods by water. OEL = Occupational Exposure Limit REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation [Regulation (EC) No. 1907/2006] SDS = Safety Data Sheet STEL = Short term exposure limit TWA = Time weighted average UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods. Varies = may contain one or more of the following 101316-69-2, 101316-70-5, 101316-71-6, 101316-72-7, 64741-88-4, 64741-89-5, 64741-95-3, 64741-96-4, 64741-97-5, 64742-01-4, 64742-44-5, 64742-45-6, 64742-52-5, 64742-53-6, 64742-54-7, 64742-55-8, 64742-56-9, 64742-57-0, 64742-58-1, 64742-62-7, 64742-63-8, 64742-64-9, 64742-65-0, 64742-70-7, 72623-85-9, 72623-86-0, 72623-87-1, 74869-22-0, 90669-74-2

Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

Section 1. Identification

Product identifier : **OCEANIC HW 740 R**

Product code : 174998 (8200)

Uses advised against : Consumer, private household, general public

Product type : Liquid.

Date of issue/Date of revision : September 11 2019.

Manufacturer - Supplier	Telephone no.:	Emergency phone:
MacDermid Offshore Solutions (ABN 84 133 834 812) 29 Dennis Street Campbellfield, VIC 3061 Australia	+61 3 9303 5150	+61 3 9303 5150 (9-5 PM)

Section 2. Hazard(s) identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (kidneys) - Category 2

GHS label elements

Hazard pictograms :

Signal word : **WARNING**

Hazard statements : **Harmful if swallowed.**
Causes serious eye irritation.
Causes skin irritation.
May cause damage to organs through prolonged or repeated exposure. (kidneys)

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Do not breathe vapour. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : Get medical attention if you feel unwell. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store in a well-ventilated place. Keep cool. Keep container tightly closed.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Continued on next page

Section 2. Hazard(s) identification

Other hazards which do not result in classification : None known.

Section 3. Composition and ingredient information

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
ethanediol Reaction mass of morpholine and 6-[(p-tosyl)amino]hexanoic acid, compound with morpholine (1:1)	40-50 10-20	107-21-1 -

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention following exposure or if feeling unwell. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 15 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : Harmful if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Continued on next page

Section 4. First aid measures

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Firefighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and material for containment and cleaning up

Continued on next page

Section 6. Accidental release measures

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not breathe vapour or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Storage temperature: -20 to 40°C (-4 to 104°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls and personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ethanediol	**Safe Work Australia (Australia, 1/2014). Absorbed through skin.** TWA: 10 mg/m³ 8 hours. Form: Particulate STEL: 104 mg/m³ 15 minutes. Form: Vapour TWA: 52 mg/m³ 8 hours. Form: Vapour TWA: 20 ppm 8 hours. Form: Vapour STEL: 40 ppm 15 minutes. Form: Vapour

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Continued on next page

Section 8. Exposure controls and personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Pink

Odour : Amine-like.

Odour threshold : Not available.

pH : 9

Melting point : Not available.

Boiling point : 100°C (212°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapour pressure : Not available.

Vapour density : Not available.

Relative density : Not available.

Continued on next page

Section 9. Physical and chemical properties

Solubility : Not available.

VOC : 428 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Section 11. Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ethanediol	LD50 Dermal	Mouse - Male, Female	3500 mg/kg	-
	LD50 Oral	Mouse	5500 mg/kg	-
	LD50 Oral	Rat	4700 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Reaction mass of morpholine and 6-[(p-tosyl) amino]hexanoic acid, compound with morpholine (1:1)	Skin - Irritant	Human	-	-	-
	Eyes - Irritant	Mammal - species unspecified	-	-	-

Sensitisation

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Additional information:

Reproductive toxicity

Not available.

Teratogenicity

Continued on next page

Section 11. Toxicological information

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
ethanediol	Category 2	Oral	kidneys

Aspiration hazard

Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Continued on next page

Section 11. Toxicological information

Acute toxicity estimates

Route	ATE value
Oral	1250 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
ethanediol	Acute EC50 >6500 mg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 >1995 mg/l Fresh water	Micro-organism	30 minutes
	Acute LC50 6900000 µg/l Fresh water	Crustaceans - Ceriodaphnia dubia - Neonate	48 hours
	Acute LC50 41000000 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 8050000 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Reaction mass of morpholine and 6-[(p-tosyl) amino]hexanoic acid, compound with morpholine (1:1)	EC50 15 mg/l	Algae - skeletonema costatum	72 hours
	LC50 200 mg/l	Crustaceans - acartia tonsa	48 hours
	Chronic LC50 >15 mg/l	Fish - cyprinodon variegatus	96 hours

Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
Reaction mass of morpholine and 6-[(p-tosyl) amino]hexanoic acid, compound with morpholine (1:1)	OECD 306 306 Biodegradability in Seawater	31 % - Inherent - 28 days	-	-

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
ethanediol	-	-	Readily
Reaction mass of morpholine and 6-[(p-tosyl) amino]hexanoic acid, compound with morpholine (1:1)	-	-	Inherent

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
ethanediol	-1.36	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Continued on next page

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	ADG	ADR/RID	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

Standard Uniform Schedule of Medicine and Poisons

Not regulated.

Model Work Health and Safety Regulations - Scheduled Substances

No listed substance

International regulations

Inventory list

United States : Not determined.

Continued on next page

Section 16. Any other relevant information

History

Date of issue/Date of revision : 9/11/2019

Date of previous issue : No previous validation

Version : 1

Prepared by

Regulatory Affairs Department
enthone.msds@macdermidenthone.com

Key to abbreviations : ADG = Australian Dangerous Goods
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
SUSMP = Standard Uniform Schedule of Medicine and Poisons
UN = United Nations

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 4	Calculation method
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2A	Calculation method
SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (kidneys) - Category 2	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Continued on next page