

North West Treatment Hub Plant Upgrade Preliminary Hazard Assessment

Sydney Water Corporation

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→ The Power of Commitment



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GHD Pty Ltd | ABN 39 008 488 373

Contact: Michaela Collard, Graduate Advisor - Risk | GHD 180 Lonsdale Street, Level 9 Melbourne, Victoria 3000, Australia **T** +61 3 8687 8000 | **F** +61 3 8732 7046 | **E** melmail@ghd.com | **ghd.com**

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Executive Summary

Sydney Water Corporation (SWC) are completing a Growth Package for North West Treatment Hub (NWTH) Plant Upgrades and Sludge Transfer System. The Review of Environmental Factors (REF) for the growth package was submitted and approved for this project in July 2022 [1]. The package primarily centres around biosolids handling at the Riverstone Wastewater Resource Recovery Facility (WRRF). Specifically, it involves transferring sludge from the Rouse Hill and Castle Hill WRRFs to the Riverstone WRRF

Due to changes since the REF was approved, an assessment is being conducted as per State Environmental Planning Policy (Resilience and Hazards) 2021 [2] for the Riverstone WRRF plant upgrades. The assessment will determine if the upgrades will be considered a 'potentially hazardous or offensive' industry. To complete this assessment, a summary of Dangerous Goods (DGs) used on-site during construction and operation, a risk screening of DGs, and a Level 1 Preliminary Hazard Analysis (PHA) were completed, as outlined in this report.

This report includes a description of the project, summary of DGs used on-site, identification of DGs expected to be transported, handled and stored on the proposal site, risk screening of DGs as per SEPP (Resilience and Hazards), and an assessment that reviews potential hazards that may arise during the construction, operation and maintenance of the development.

The results of the DGs and transport screening indicate that the proposal does exceed the SEPP (Resilience and Hazards) threshold for class 8 DGs (corrosives). As a result, the proposal is considered to have a low potential for harm.

The Level 1 PHA was conducted as a qualitative desktop study and systematically identified any potential off-site impacts and mitigation measures to control identified hazards. The results of the hazard identification indicates that no hazards have the potential for off-site harm. However, there are five risks identified with the potential consequence of an on-site fatality:

- 1. Vehicle interaction within the modification area
- 2. Natural hazards
- 3. Fire started within the project area
- 4. Loss of containment of LPG during re-filling of the tank
- 5. Explosion due to the biogas generated from the digesters

While these risks are deemed critical in consequence the likelihood of the hazard is found to be rare or very unlikely. This was due to the hazards with potential for fatality being suitably controlled using the safeguards defined in Table 6. Based on these likelihood and consequence ratings the highest hazards identified is a medium risk which SWC deems as an acceptable level of risk within its Risk Management Framework.

The hazard identification and analysis demonstrate that the proposal can be designed, constructed, and operated in a manner that will meet the relevant regulations, standards and policies and minimise hazardous impact to the public.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

Sydney Water Corporation (SWC) has an approved Review of Environmental Factors (REF) for the North West Treatment Hub (NWTH) Plant Upgrades and Sludge Transfer System – Growth Package under part 5 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). The 2022 approved REF centralised on the biosolids handling at Riverstone Wastewater Resource Recovery Facility (WRRF), which will transfer sludge from Rouse Hill and Castle Hill WRRFs to Riverstone WRRF.

The NWTH program aims to diversify solid management and be prepared if it is found that alternate methods are needed for solids processing. A review of technology available for advanced processing of biosolids to reduce contaminants of concern was undertaken and found that gasification with upstream digestion, dewatering and drying, was the preferred technology.

1.1 Purpose of this report

SWC have engaged GHD Pty Ltd (GHD) to undertake a Preliminary Hazard Analysis (PHA) for the new gasification system at Riverstone WRRF. Even though the initial REF was approved in July 2022, subsequent changes to the project scope necessitate an assessment to inform the Addendum REF for the project.

1.2 Scope and limitations

GHD was commissioned by SWC to prepare a risk screening to determine if the proposed development 'Riverstone WRRF plant upgrades' ('the proposal') is 'potentially hazardous or offensive' in accordance with the State Environmental Planning Policy (SEPP) (Resilience and Hazards) [2] and requires a PHA.

This report provides sufficient information and assessment of risks to demonstrate that the project will prevent, or mitigate the identified impacts, including human health, the environment and property, associated with the proposal and that the residual risk levels are acceptable in relation to the surrounding land use.

As such, this report focuses on the impact of potential hazards associated with the use of dangerous goods (DGs) and hazardous substances that may arise during the construction and operation of the project. Specifically, this report:

- Describes the existing environment with respect to the project
- Screens the quantities of DGs expected to be used during construction and operation of the project
- Assesses the impacts of construction and operation of the project specific to DGs and other hazardous substances
- Determines if the proposal is deemed a 'potentially hazardous or offensive industry'.
- Completes a PHA if the proposal is deemed a 'potentially hazardous or offensive industry'.

This report: has been prepared by GHD for Sydney Water Corporation and may only be used and relied on by Sydney Water Corporation for the purpose agreed between GHD and Sydney Water Corporation as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Sydney Water Corporation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

The following assumptions have been made in the preparation of this report:

- DG quantities provided are true and correct at the time of the screening
- The chemical data (UN number, dangerous goods classification) was based on available Safety Data Sheets (SDS) and are referenced in Appendix A.
- All plant and equipment items are installed and operated in accordance with appropriate Australian Standards, codes, and guidelines
- DGs are stored in accordance with the Australian Dangerous Goods Code (ADG Code), relevant standards and guidelines, even if not a licensable quantity
- All equipment and systems are designed to be inherently safe
- All equipment is maintained and operated as designed
- The location of the Riverstone WRRF plant upgrades, as assessed in this report, is as shown in the site plan in Appendix B.
- Other DGs brought to site (not stored on-site) during construction and for routine work are minimal and are therefore not included in the assessment.
- The Liquified petroleum gas (LPG) storage on-site will be a buried LPG storage bullet.

Any changes to the assumptions used in this report should result in a review of the screening process and update as required.

2. Site description

2.1 Site process

The Riverstone WRRF became operational in 1986 and services up to 90,000 residents of NSW.

The facility follows strict licence conditions issued by the NSW Environment Protection Authority (EPA) to monitor the effect of discharges on water quality and aquatic life. It treats wastewater before either reusing it or discharging it into rivers or oceans. The treatment process involves three levels:

- Primary treatment includes screens, sedimentation, grit removal, and oil/grease removal.
- Secondary treatment focuses on removing carbonaceous organic matter and nutrients (nitrogen and phosphorus) from wastewater.
- Tertiary treatment further refines the water quality, making it suitable for reuse or safe discharge.

The facility also produces biosolids, which are nutrient-rich materials created from treating wastewater solids. These biosolids contain valuable phosphorus and nitrogen and can be used in agriculture, composting, and land rehabilitation.

The key changes that are proposed at Riverstone WRRF from the original REF design relevant to this study are:

- New gasification plant and associated infrastructures, including two new exhaust stacks (the existing stack will be retained)
- Production of biochar, rather than biosolids under normal operation (with a pathway for biosolids output in maintenance scenarios)
- No expansion of existing anaerobic digestion and no upgrade to waste gas burners
- Deletion of cogeneration unit from the scope.

The gasification process consists of:

- Digestion of Primary Sludge: Primary sludge is digested in existing digesters which is upgraded for improved performance.
- Sludge Blending and Mixing: Undigested waste activated sludge (WAS) and primary sludge are blended in a sludge mixing tank. Consistent mixing of the two sludge types is crucial for successful drying and gasification processes.
- Dewatering: The mixed sludge is dewatered using centrifuges.
- **Biogas Utilisation:** Biogas generated from the digesters heats the digesters via existing compressors and gas heaters. Excess gas now provides supplementary heat to the dryer and gasification heat loop.
- Drying and Gasification: Dewatered sludge is dried and transferred to gasifiers. In the gasification chamber, dried sludge is heated to 600–700°C with limited oxygen supply. Organic content in the sludge is gasified, producing syngas. Syngas is transferred to a thermal oxidisation chamber via gas filtration, generating heat. Some heat is recovered to further heat the gasification process, while the remainder is discharged as flue gas.
- Off-Gas Treatment: Off gases from each step are treated before discharge: Biological scrubbing and carbon treatment for dewatered sludge gases via the existing site odour control system. Chemical scrubbing for sludge dryer gases and activated carbon treatment for flue gas from the gasifier.
- Final Product: The final product is biochar.

2.2 Land use

The project site is surrounded by industrial land use area, with other business surrounding the site boundary. A TransGrid 330 kV substation (light blue icon in Figure 1) is located 100 metres to west of the site boundary. Additionally, two construction companies and a pallet supplier, BQ Pallets, are located close to the site boundary (dark blue icons in Figure 1). A childcare centre is also located approximately 450 metres from the site boundary (pink icon in Figure 1).



Figure 1 Site boundary and surrounding land use [3]

3. Legislative and policy context

3.1 Review of Environmental Factors (REF)

A REF is a document that examines the potential impacts of an activity on the environment. Public authorities in NSW are required to undertake a REF under Part 5 of the EP&A Act. The Department must consider several factors set out in the Environmental Planning and Assessment Regulation 2000 in order to discharge its obligations under Part 5 of the EP&A Act.

A REF for the NWTH Plant Upgrades and Sludge Transfer System (Growth Package) was submitted and approved for this project in July 2022 [1]. An Addendum REF will be submitted due to the recent changes to the project.

3.2 State Environmental Planning Policy (Resilience and Hazards)

The NSW Department of Planning and Environment consolidated the state environmental planning policies (SEPPs) in December 2021, for introduction in March 2022. As a result, the previously named *SEPP 33 – hazardous and offensive development provisions* [2] have been transferred to the SEPP (Resilience and Hazards). No policy changes have been made. The SEPP consolidation does not change the legal effect of the SEPPs being repealed and section 30A of the *Interpretation Act 1987* applies to the transferred provisions, meaning the transfer does not affect the operation or meaning of the SEPP provisions.

The Department of Planning and Environment, NSW, 2011, *Applying SEPP 33* [4]: *Hazardous and Offensive Development Application Guidelines* continues to provide the process for assessing if developments are potentially hazardous or offensive, including threshold levels that trigger the potentially hazardous or offensive status. *Applying SEPP 33* is the main guidance document that has been followed for this PHA.

3.3 Hazardous Industry Planning Advisory Paper No 4

The Department of Planning and Environment, NSW, 2011, *Hazardous Industry Planning Advisory Paper No 4* – *Risk Criteria for Land Use Safety Planning* (HIPAP No 4) [5] sets out risk criteria for industries that are considered hazardous to comply to. This document is used when *Applying SEPP 33* [4] indicates a development is potentially hazardous.

3.4 Hazardous Industry Planning Advisory Paper No 6

The Department of Planning and Environment, NSW, 2011, *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (HIPAP No 6) [6] lists the process required for undertaking a PHA. This document is used when *Applying SEPP 33* [4] indicates a development is potentially hazardous.

4. Methodology

The method to determine whether a project would be deemed potentially hazardous or potentially offensive and the required follow up assessments is provided in Table 1.

Table 1	Applying SEPP 33 method for potentially hazardous or offensive industries [4]
	Apprying der i do method for potentiany nazardous of onensite industries [4]

Issue	Methodology to determine if potentially hazardous / offensive	Follow up assessment if confirmed as potentially hazardous / offensive industry
Potentially hazardous industry	Applying SEPP 33 risk screening process	Preliminary Hazard Analysis (PHA) required
Potentially offensive industry	Review of potential impacts to the amenity of the site or discharges, such as emissions (e.g. noise, air)	Meeting any licencing requirements issued by relevant authorities e.g. NSW Environmental Protection Agency (EPA) is required

The Applying SEPP 33 process is discussed in Sections 4.1 to 4.3.

4.1 Risk screening

Applying SEPP 33 relates to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'.

A 'hazardous industry' is one in which when all locational, technical, operational, and organisational safeguards are employed, continues to pose a significant risk, as per the requirements of SEPP (Resilience and Hazards). A 'potentially offensive industry' is one which would, in the absence of safeguards, emit a polluting discharge which would cause a significant level of offence.

SEPP (Resilience and Hazards) requires a screening process be undertaken. The overall risk screening process, as outlined in *Applying SEPP 33* is summarised in Figure 2.

The risk screening process concentrates on the storage of specific DG classes that have the potential for significant off-site effects. Specifically, the assessment involves the identification of classes and quantities of all DGs to be used, stored, or produced on-site with an indication of storage locations. The quantities of DGs are then assessed against the *Applying SEPP 33* threshold quantities. If any of the *Applying SEPP 33* threshold quantities are exceeded, then that the project is potentially hazardous, then a PHA is required.

If the project is potentially offensive, after considering the quantity and nature of any discharges and the significance of the offence likely to be caused, having regard to surrounding land use and the proposed controls, then additional controls are required.

4.2 Hazard identification

Following screening, *Applying SEPP 33* requires a determination of whether the proposal poses significant risk or offence. This requires identification of potential hazards to highlight any risks associated with the interaction of the proposal (as a whole) with the surrounding environment (i.e. a systematic process to identify any potential off-site impacts).

The Hazard Identification (HAZID) process is a desktop assessment and involves documenting possible events that could lead to a possible off-site incident. The assessment then lists the potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or mitigate their impact. The HAZID process identifies the scenarios relevant to the PHA, should it be required.

4.3 Preliminary hazard analysis

For a development proposal classified as 'potentially hazardous', a PHA is required to determine the risk to people, property, and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used to determine if the development proposal is classified as a 'hazardous industry'. If this is the case, the development proposal may not be permissible within most industrial zonings in NSW.

The PHA identifies the potential hazards, analyses these hazards in terms of their impact to people and the environment and their likelihood of occurrence, quantifies the resulting risk to surrounding land uses and assess the risk to demonstrate that the proposal will not impose an unacceptable level of risk.

Applying SEPP 33 has three levels of PHA. If a PHA is required, a judgement of the level of risk associated with the proposal is determined using the results of the screening and HAZID stages.

The three levels of PHA are:

- Level 1 if low potential for harm is identified, a qualitative PHA is completed
- Level 2 if medium potential for harm is identified, a semi-quantitative PHA is completed
- Level 3 if high potential for harm is identified, a quantitative PHA is completed



Figure 2

SEPP (Resilience and Hazards) risk screening process [2]

5. Risk screening

5.1 Dangerous goods screening

A DG is a substance or article that poses a risk to people, property, or the environment [4]. Each class represents a different type of DG. Some classes are divided into packing groups where Packing Group (PG) I substances present a high level of danger, PG II substances present a medium level of danger, and PG III substances present a low level of danger. A summary of the different DG classes is shown in Table 2.

DG Class	Packing Group	Description
1.1	N/A	Substances and articles which have a mass explosion hazard
1.2	N/A	Substances and articles which have a projection hazard but not a mass explosion hazard
1.3	N/A	Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both but not a mass explosion hazard
1.4	N/A	Substances and articles which present no significant hazard
1.5	N/A	Very insensitive substances which have a mass explosion hazard
1.6	N/A	Extremely insensitive articles which do not have a mass explosion hazard
2.1	N/A	Flammable gases
2.2	N/A	Non-flammable, non-toxic gases
2.3	N/A	Toxic gases
3	I, II, or III	Flammable liquids
4.1	I, II, or III	Flammable solids, self-reactive substances and solid desensitised explosives
4.2	I, II, or III	Substances liable to spontaneous combustion
4.3	I, II, or III	Substances which in contact with water emit flammable gases
5.1	I, II, or III	Oxidising substances
5.2	I, II, or III	Organic peroxides
6.1	I, II, or III	Toxic substances
6.2	I, II, or III	Infectious substances
7	N/A	Radioactive material
8	I, II, or III	Corrosive substances
9	I, II, or III	Miscellaneous dangerous goods and articles

 Table 2
 Dangerous good classes [4]

Note, Class 1 combustible liquids are not classified as DGs under the United Nations (UN) but are considered DGs under workplace legislation.

5.1.1 Construction of the project

Due to the nature of constructing the Riverstone WRRF plant upgrades it is expected that chemicals used during the construction of the proposal will be present in small quantities. A standard list of construction material and quantities have been included in Table 3. Therefore, the SEPP (Resilience and Hazards) threshold is not expected to be exceeded during construction.

Table 3	Construction	dangerous	goods	screening
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Chemical/ product	UN #	DG Class	Packing group	Expected storage quantity	SEPP (Resilience and Hazards) combined storage threshold	Exceedance of SEPP (Resilience and Hazards) threshold
Spray paint	multiple	2.1 – pressurised	N/A	0.02	0.1	Pass (does not exceed)
Liquefied Petroleum Gas (LPG)	1075	2.1 – liquified and pressurised	N/A	0.09	10	Pass (does not exceed)
Acetylene (welding)	1001	2.1 – liquified and pressurised	N/A	0.33	0.5	Pass (does not exceed)
Oxygen (welding)	1072	5.1	N/A	0.3	5	Pass (does not exceed)
Paint (oil based considered worst case)	1263	3	II	0.1	5	Pass (does not exceed)
Solvents	multiple	3	II	0.1		
Epoxy resins	multiple	3	III	0.1	5	Pass (does not exceed)
Cleaning products	multiple	8	II	0.005	25	Pass (does not exceed)
Diesel (C1)	3082	9	111	2.5	None	Pass (excluded) *
General oils and lubricants (C2)	1791	9	Ш	0.5	-	
Sealants / joint fillers	N/A	Not classified as	DG	0.05	Not applicable	
Detergent	N/A	Not classified as	DG	0.005	Not applicable	
Cement, grout, ready-mix concrete	N/A	Not classified as	DG	Used on demand	Not applicable	
Concrete curing compounds and formwork de- bonding	N/A	Not classified as	DG	Used on demand	Not applicable	
Steel – reinforcing steel and structural steel	N/A	Not classified as	DG	Used on demand	Not applicable	

5.1.2 Operation of the project

A summary of the chemicals proposed to be used or stored on-site during operation of the proposal is shown in Table 4. Assumptions that have been made about the usage of these chemicals on-site, DG classification, quantities, and whether the chemicals exceed the SEPP (Resilience and Hazards) threshold have also been provided in Table 4. The SEPP (Resilience and Hazards) combined storage threshold is exceeded during operation.

Table 4	Operations d	angerous	aoods	screenina
	operations a	ungerous	90045	Sereening

Chemical/ product	UN #	DG Class	Packing group	Expected storage quantity (tonnes)	SEPP (Resilience and Hazards) combined storage threshold (tonnes)	Exceedance of SEPP (Resilience and Hazards) threshold	Comments / assumptions
LPG	1075	2	I	11.7	40	Below the threshold	The threshold for LPG is based on the storage being buried
Sodium Hydroxide (Caustic soda - liquid (5%-45%))	1824	8	11	37.1	25	Above the threshold	
Sulfuric acid (>10% - 51%)	2796	8	II	14.0			
Sodium Hypochlorite Solution (10-15% Available Chlorine)	1791	8	II	18.0	-		
Ammonia Solution 25% w/w	2672	8	III	0.9	50	Below the threshold	Ammonia solution is an alternative to urea. It is proposed that only one will be stored on site. However, both have been including in the dangerous goods screening for completeness.
SINOPEC Aqueous Urea Solution AUS 32	N/A	Not class	ified as DG				

5.2 Transport screening

5.2.1 Construction of the project

It is assumed that during construction of the project, there would be low volumes of DGs stored in the construction compound. Therefore, the transportation volumes of chemicals during construction are considered to be minimal. Based on this, the Applying SEPP 33 transport thresholds for construction of the project are not exceeded.

5.2.2 Operation of the project

This *Applying SEPP 33* transport screening relates to the carriage of DGs to and from the proposal site. Table 5 shows the transport screening for the operation of the proposal. This includes the expected vehicle movements of each DG Class and the vehicle movement thresholds according to *Applying SEPP 33*.

The DGs are stored on site for approximately 30 days or more of operational consumption, therefore requiring a monthly delivery to site. The Ammonia Solution is the only DG which may require delivery 2 to 4 times a month therefore 48 deliveries annually. Based on this, the Applying SEPP 33 transport thresholds for operations of the project are not exceeded.

Table 5 Operations transport screening

Chemical/ product	DG Class	Combined quantity (as per Table 4)	Combined transport movements (annual)	Transport movements threshold (annual)	Exceedance of SEPP (Resilience and Hazards) threshold
Liquefied Petroleum Gas (LPG)	2	11.7	12	>500	Does not exceed threshold
Sodium Hydroxide (Caustic soda - liquid (5%- 45%)	8	37.1	12	>500	Does not exceed threshold
Sulfuric acid >10% - 51%	8	14.0	12	>500	Does not exceed threshold
Sodium Hypochlorite Solution (10- 15% Available Chlorine)	8	18.0	12	>500	Does not exceed threshold
Ammonia Solution 25% w/w	8	0.9	48	>500	Does not exceed threshold
SINOPEC Aqueous Urea Solution AUS 32	Not clas	sified as DG			

5.3 Summary of risk screening results

According to Applying SEPP 33, if any of the screening thresholds are exceeded then the proposed development should be considered a 'potentially hazardous industry' and a PHA is required.

The results of the dangerous goods screening indicate that during operation, the proposed Riverstone WRRF plant upgrades does exceed the thresholds within the SEPP (Resilience and Hazards) requirements for DG storage. The project is therefore considered a 'potentially hazardous industry' and a PHA is required.

The results of the transport screening, however, do not exceed the dangerous good movement thresholds as there are expected to be minimal deliveries. If changes occur to the proposed movement of dangerous goods, it is recommended that the screening process be repeated to determine if a route evaluation is required.

Given the type of dangerous goods that have exceeded the threshold (class 8 – corrosive liquids), a Level 1 PHA (qualitative hazard identification) is required, which is provided in Section 6.

Any change to the separation distance, the proposed design or increase in DG inventories will require a review of this assessment.

Additionally, as the Riverstone WRRF plant upgrades is expected to hold an EPA licence throughout the life of the project, and comply to said licence conditions, the proposal is not considered to be 'offensive'.

6. Preliminary Hazard Assessment

Based on the DGs screening a low potential for harm is identified from the class 8 – corrosive liquid storage. Therefore, a Level 1, qualitative PHA is completed.

6.1 Hazard identification (HAZID)

The results of the HAZID associated with Riverstone WRRF plant upgrades are presented Table 6. The hazard identification was conducted as a desktop study and focused specifically on the operational activities as a result of the upgrade. Safeguards are also outlined in Table 6 and are required to ensure the risk scenarios that were identified are contained or at least controlled to an acceptable level.

In undertaking the HAZID, several assumptions were made, as listed in Section 1.3.

The study identified that there was no credible scenario with the potential for off-site impact.

Five scenarios with a potential for a single on-site fatality were identified. However, the likelihood of a scenario with this consequence is estimated to be very unlikely or rare due to the safeguards in place to manage the risk.

The SWC risk criteria was used to assess the consequence and likelihood of each of the risk scenarios. This risk criteria are located in Appendix C. Based on SWC risk criteria, the hazards are medium or low therefore an acceptable level of risk which require the monitoring the risk but no additional actions.

Table 6 Hazard identification for Riverstone WRRF plant upgrades'

ID	Hazard scenario	Phase	Cause	Consequences	Potential for off-site impact	Identified / recommended safeguards
1	Vehicle interaction within the modification area	Construction	Vehicle movements in vicinity of personnel	Personnel injury or fatality	No	 Prepare traffic management plans including standard traffic rules and signage for construction and operation & maintenance Site speed limits Site layout to minimise vehicle reversing Designated pedestrian areas for construction and operation Driver competency Safe Work Method Statements (SWMS) Machine inductions/licensing
2	Natural hazards	Construction	Flooding Earthquake Lightning Bushfire	Personnel injury or fatality Asset damage Plant shut down	No	 A construction environmental management plan Bushfire Management Plan updated Earthing and bonding strategy, including provision of lightning arrestors. Housekeeping standards Site drainage A construction emergency response plan
3	Fire started within the project area	Construction	Hot works Arson Electrical fault Flammable materials on-site	Personnel injury or fatality Asset damage Plant shut down	No	 Manage fuel for vehicles and machinery on site to appropriate standards A construction environmental management plan A hot work permit process Site security Housekeeping standards Inspection and maintenance regime Fire management and emergency response procedures
4	Contact with chemicals, including dangerous goods	Construction	General construction activities (welding, refueling) Vegetation management (biocide)	Personnel injury	No	 Store chemicals in line with appropriate standards, such as AS1940 for flammable and combustible liquids, and AS3780 for corrosives. Regular inspection and maintenance regime for chemical storage areas Standard handling procedures SWMS detailing safe methods & procedures for chemical handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals SDS available on-site

Consequence	Likelihood	Risk Rating
Critical	Rare	Medium
Critical	Rare	Medium
Critical	Very Unlikely	Medium
Moderate	Very Unlikely	Low

ID	Hazard scenario	Phase	Cause	Consequences	Potential for off-site impact	Identified / recommended safeguards
5	Loss of containment of LPG from the on- site storage tank	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury or fatality Fire Explosion Asset damage	No	 The site layout (Appendix C) locates the LPG as approximately 125 m from the site boundary The storage tank will be buried to protect from external factors including extreme weather, external impact and to reduce the risk or fire in case of a leak or rupture. Store LPG in line with appropriate standards, AS/NZS 1596:2014 The storage and handling of LP Gas Regular inspection and maintenance regime for the LPG Storage Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals
6	Loss of containment of LPG during re- filling of the tank	Operation	Overfill of tank during tank filling Tanker drive away whilst connected Flexible hose failure (leak/rupture) Operator error - incorrect connection of flexible hose (connection fails)	Personnel injury or fatality Fire Explosion Asset damage	No	 Where appropriate pipework should be buried or above vehicle height to minimise likelihood of vehicle interaction or external forces Training and competency of individual completing the transfer Appropriate design of refilling including intake pipes and valves SWMS detailing safe methods & procedures for LPG handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals Comprehensive emergency plan and procedures provided for handling corrosives
7	Loss of containment of Sodium Hydroxide (Caustic soda - liquid (5%-45%)) from the on-site storage tank	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury Asset damage	No	 Store sodium hydroxide in line with appropriate standards, AS 3780 - The Storage and Handling of Corrosive Substances Regular inspection and maintenance regime for the chemical storage SWMS detailing safe methods & procedures for chemical handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals SDS available on-site Comprehensive emergency plan and procedures provided for handling corrosives

Consequence	Likelihood	Risk Rating
Major	Very Unlikely	Medium
Critical	Rare	Medium
Moderate	Rare	Low

ID	Hazard scenario	Phase	Cause	Consequences	Potential for off-site impact	Identified / recommended safeguards
8	Loss of containment of sulfuric acid (>10% - 51%) from the on- site storage tank	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury Asset damage	No	 Store sulfuric acid in line with appropriate standards, AS 3780 - The Storage and Handling of Corrosive Substances Regular inspection and maintenance regime for the chemical storage SWMS detailing safe methods & procedures for chemical handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals SDS available on-site Comprehensive emergency plan and procedures provided for handling corrosives
9	Loss of containment of sodium hypochlorite solution (10-15% available chlorine) from the on-site storage tank	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury Asset damage	No	 Store sodium hypochlorite solution in line with appropriate standards, AS 3780 - The Storage and Handling of Corrosive Substances Regular inspection and maintenance regime for the chemical storage SWMS detailing safe methods & procedures for chemical handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals SDS available on-site Comprehensive emergency plan and procedures provided for handling corrosives
10	Loss of containment of ammonia solution (25% w/w) from on- site Intermediate Bul Container (IBC)	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury Asset damage	No	 Store ammonia solution in line with appropriate standards, AS 3780 - The Storage and Handling of Corrosive Substances Regular inspection and maintenance regime for the chemical storage SWMS detailing safe methods & procedures for chemical handling and transfer Spill kits to be used in the event of an incident involving release of chemicals PPE to all staff handling chemicals SDS available on-site Comprehensive emergency plan and procedures provided for handling corrosives Pallet bunds used for IBC Storage

Consequence	Likelihood	Risk Rating
Moderate	Rare	Low
Moderate	Rare	Low
Minor	Rare	Low

ID	Hazard scenario	Phase	Cause	Consequences	Potential for off-site impact	Identified / recommended safeguards
	Loss of containment of SINOPEC Aqueous Urea Solution AUS 32 from the on-site storage tank	Operation	Large spill or leak Human error Damage to storage tank e.g., due to external impact or wear/ corrosion	Personnel injury Asset damage		 Store aqueous urea solution in line with appropriate standards, AS 3780 - The Storage and Handling of Corrosive Substances Regular inspection and maintenance
11					No	 regime for the chemical storage SWMS detailing safe methods & procedures for chemical handling and transfer
						 Spill kits to be used in the event of an incident involving release of chemicals
						PPE to all staff handling chemicalsSDS available on-site
12	Combustion of the discharged product BioChar	Operation	Ignition source in proximity (e.g. hot, works) Inappropriate storage Re-ignition	Personnel injury Fire Asphyxiation Asset damage	No	 Appropriate storage or Biochar to control moisture and ash content Regular inspection and maintenance regime for the biochar storage SWMS detailing safe methods & procedures for biochar handling and transfer PPE to all staff handling or around the BioChar SDS available on-site If a BioChar fire occurs it will be monitored proteing for 20 hours [7] to minimize
						risk of re-ignition
13	Dust exposure from the BioChar	Operation	Inappropriate storage Excess movement or handling of the BioChar	Personnel injury (irritates respiratory system eye and skin) Explosion	No	 Ventilation within the bag house SWMS detailing safe methods & procedures for biochar handling and transfer PPE while handling or around the BioChar SDS available on-site
14	Explosion due to the biogas generated from the digesters	Operation	Tank, pipework or flange leak	Personnel injury Explosion Asphyxiation Asset damage	No	 SDS available on-site Regular inspection and maintenance regime for the digesters Leak detection The excess biogas will be used in the process to provide supplementary heat to the dryer and gas heaters.

Consequence	Likelihood	Risk Rating
Minor	Rare	Low
Major	Very Unlikely	Medium
Moderate	Rare	Low
Critical	Rare	Medium

7. Risk management

7.1 Appropriate chemical storage

Any chemicals brought on-site should be stored in accordance with the relevant Australian Standards. It is recommended that each chemical have appropriate labelling, separation where necessary, and disposal in accordance with Australian Standards.

A brief summary of the new dangerous goods or hazardous materials stored on the premises is provided in 7.1.1 to 7.1.6.

7.1.1 LPG

LPG is a fuel used in domestic, commercial, industrial and automotive applications. LPG compositions will vary depending upon whether supplied a propane or butane.

LPG is a highly flammable gas. It can ignite easily when exposed to an open flame or spark. When heated and under pressure, LPG may explode, posing a significant safety risk. In high concentrations, LPG can also lead to asphyxiation.

7.1.2 Sodium hydroxide

Sodium hydroxide (NaOH) solution also known as caustic soda is a colourless liquid with a boiling point of 119°C.

Sodium hydroxide is corrosive to aluminium, zinc and tin, reacts violently with acids and salts, and absorbs carbon dioxide from the air. Ingestion may result in nausea, vomiting, diarrhoea, abdominal pain, swelling of the larynx and subsequent suffocating, perforation of the gastrointestinal tract, cardiovascular collapse, and coma. It is corrosive to the eyes and skin.

The sodium hydroxide will be stored on-site in a solution of 30% but delivered at 50% and diluted on-site.

7.1.3 Sulphuric acid

Sulphuric acid (H₂SO₄) is a strong acid with a pH of below 1. It may be corrosive to metals, is non-combustible, and a strong oxidiser. Heating may cause expansion or decomposition leading to the violent rupture of containers.

If inhaled, sulphuric acid may be fatal and if touched, it causes severe skin burns and eye damage, and is a known carcinogen,

The sulphuric acid will be stored on-site in a solution of less than 51%.

7.1.4 Sodium Hypochlorite

Sodium hypochlorite (NaOCI), commonly used as bleach, is a clear, pale yellow, or greenish liquid with a characteristic pungent, chlorine-like odour. It is slightly explosive in the presence of heat and react with many organic solvents.

Sodium hypochlorite forms corrosive mixtures with water and is highly toxic to aquatic organisms, causing a pH shift in water. It is extremely dangerous to humans if consumed as even 30 mL of a solution with 15% available chlorine may be lethal. It is also extremely dangerous if inhaled or brought into contact with the skin or eyes.

The on-site storage solution typically contains 10-30%, resulting in 10-15% available chlorine.

7.1.5 Ammonia

Ammonia (NH₃) is widely used in fertilizers and pharmaceuticals. If ammonia contacts the eyes, throat, and lungs, it can cause a corrosive injury. Exposure to high levels of ammonia in the air may irritate the skin, eyes, throat, and lungs, leading to coughing and burns, and in extreme cases and lung damage.

The on-site storage solution typically contains 30-60% ammonia hydroxide and 10-30% ammonia anhydrous liquefied.

7.1.6 SINOPEC Aqueous Urea Solution AUS 32

The SINPOEC aqueous urea solution AUS 32 is not classified as a dangerous good. The solution is colourless with a and a boiling point of 100°C. It has a pH of 9 to 11 and is stable under normal conditions. It contains approximately 32% urea and 68% water.

7.2 Spill management

Appropriate safe work procedures or SWMS should be implemented for the handling of all chemicals including transfer, storage, spill prevention, and clean up requirements. This will include having spill kits readily available and trained and competent staff who understand the safe practices of cleaning a spill. Regular training should be implemented to help staff remain informed on procedures and safe practices.

7.3 Asset management

Asset management is an integral part of risk management and will assist in minimising the likelihood of a loss of containment scenario.

Inspection and maintenance regime for the chemical storage and new equipment will help prevent possible leaks or failures. Timely inspections allow for early detection of potential issues, preventing them from escalating into major problems.

Asset design at the start of the project must also consider chemical storage areas are correctly designed. This also includes the appropriate design, maintenance and inspection of bunds around the storage.

7.4 Emergency planning

The proposal is an upgrade to the exiting site hence all emergency response documents should be updated to reflect relevant changes on-site. This should include understanding how the upgrades will affect operations, infrastructure and potential risks. Additionally, emergency drills should be completed to test response effectiveness and changes.

Emergency services will also require access to the SDS register of all chemicals that are located on-site. Therefore, the SDS for all new chemicals should be located on-site and readily available.

7.4.1 Bushfire

The natural hazard of a bushfire is identified in Table 6, the control to help mitigation this risk is the Bushfire Management Plan (BMP) for Riverstone WRRF. The BMP should incorporate mitigation strategies, site assessment, mapping, storage of flammable materials, and emergency response. Like all other emergency response documents, it should be updated based on the changes to the site.

8. Conclusion

This report includes a risk screening of the proposal in accordance with the requirements of SEPP (Resilience and Hazards). The results indicate that the screening thresholds for DG storage during operation of the proposal is exceeded.

The screening threshold is exceeded due to Class 8 II Corrosive DGs, therefore the proposal is deemed 'potentially hazardous' and a Level 1 PHA was developed.

The PHA was undertaken as a qualitative desktop study as a systematic way of identifying potential off-site impacts. The PHA identified no hazards with the potential for off-site impact. However, there are five risks identified with the potential consequence of an on-site fatality:

- 1. Vehicle interaction within the modification area
- 2. Natural hazards
- 3. Fire started within the project area
- 4. Loss of containment of LPG during re-filling of the tank
- 5. Explosion due to the biogas generated from the digesters

While these risks are deemed critical in consequence the likelihood of the hazard is found to be rare or very unlikely. This was due to the hazards with potential for fatality being suitably controlled using the safeguards defined in Table 6. Based on these likelihood and consequence ratings the highest hazards identified were a medium risk which SWC deems as an acceptable level of risk.

The PHA also considered the management of risk at Riverstone with four main controls, these include:

- Appropriate chemical storage
- Spill management
- Asset management
- Emergency planning

The hazard identification and analysis demonstrate that the proposal can be designed, constructed, and operated in a manner that will meet the relevant regulations, standards and policies and minimise hazardous impact to the public.

Any changes to the assumptions used in this report should result in a review and update of the screening, HAZID, and PHA processes.

9. Abbreviations

Table 7 Abbreviations

ADGAustralian Dangerous Goods CodeBMPBushfire Management PlanDGDangerous GoodEPANSW Environment Protection AuthorityEP&AEnvironmental Planning and Assessment

DG	Dangerous Good
EPA	NSW Environment Protection Authority
EP&A	Environmental Planning and Assessment
GHD	GHD Pty Ltd
HAZID	Hazard Identification
HIPAP	Hazardous Industry Planning Advisory Paper
IBC	Intermediate Bul Container
LPG	Liquified Petroleum Gas
NSW	New South Wales
NWTH	North West Treatment Hub
PG	Packing Group
PHA	Preliminary Hazard Analysis
PPE	Personal Protective Equipment
REF	Review of Environmental Factors
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SEPP	SEPP (Resilience and Hazards), formerly called State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
SWC	Sydney Water Corporation
SWMS	Safe Work Method Statement
UN	United Nations
WAS	Waste Activated Sludge
WRRF	Wastewater Resource Recovery Facility

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SAFETY DATA SHEET FOR Liquefied Petroleum Gas (LPG)

1. IDENTIFICATION: PRODUCT IDENTIFIER AND CHEMICAL IDENTITY

Product Name	Liquefied Petroleum Gas (LPG)
Proper Shipping Name	Petroleum Gases, Liquefied
Other Names	LPG, LP Gas, Propane, Butane, AutoGas
Uses	As an energy source in the residential, commercial and automotive markets.
Supplier Name Address	A feedstock for the petrochemical industry and as a refrigerant. ELGAS Ltd, A.C.N. 002 749 260 10 Julius Avenue, North Ryde NSW 2113 PO Box 1336, Chatswood NSW 2067
Telephone	AUSTRALIA (02) 8094 3200 +61 2 8094 3200 (Outside Australia)
Fax	(02) 9018 0146
Website	www.ELGAS.com.au
Emergency	+61 3 9706 9897 (Outside Australia) (24 hours)

2. HAZARDS IDENTIFICATION

GHS Classifications Flan	nmable Gases: CATEGORY 1
Gas	es Under Pressure: Liquefied Gas
Pictograms	
Signal Word DAN	IGER
Hazard Statements H22	0 - Extremely flammable gas
H28	0 - Contains gas under pressure; may explode if heated
Prevention P21	0 - Keep away from heat/sparks/open flames/hot sources. No smoking.
Response P37	7 - Leaking gas fire: Do not extinguish, unless leak can be stopped
safe	ly.
P38	 Eliminate all ignition sources if safe to do so.
Storage P41 Other Hazards High Refe	0 + P403. Store in a well-ventilated space. I levels of exposure can lead to asphyxiation and fatal arrhythmia. For to Section 11 of the SDS.

	3. COMPOSITION / INFORMATION ON INGREDIENTS			
LPG:	Propane Proportion:	Butane Proportion:	AutoGas Proportion:	CAS Number: 68476 – 85 – 7
Propane:	40 – 99%	<5%	40 – 99%	0074 - 98 - 6
Propene:	<60%	<5%	<20%	115 – 07 – 1
n-Butane, iso-Butane:	<7.5%	90 – 99%	<50%	106 – 97 – 8,
Ethane:	<5%	<5%	<5%	73 - 28 - 3 74 - 84 - 0
Ethyl Mercaptan (Odourant):	25 ppm	25 ppm	25 ppm	75 – 08 – 1

	4. FIRST AID MEASURES
In all cases se	ek medical attention and see the ELGAS Super Cold Contact Injuries Hospital Information Sheet for further information and procedures.
Eye	Treatment for cold burns: Immediately flush with room-temperature water or with sterile saline solution. Hold eyelids apart and irrigate for 15 minutes. Seek urgent medical attention.
Inhalation	Remove from area of exposure immediately. Be aware of possible explosive atmospheres. If victim is not breathing apply artificial respiration and seek urgent medical attention. Give oxygen if available. Keep warm and rested.
Skin	For cold burns: Immediately soak all clothing over the affected area and flush or soak affected skin with room-temperature to warm water (40 C max.) for a minimum of 15 minutes. For large burns, immerse the affected area in room-temperature to warm water (40 C max.) for a minimum of 15 minutes.
	For hot burns: Immediately soak all clothing over the affected area and flush or soak affected skin with room-temperature water only for a minimum of 15 minutes. For large burns, immerse the affected area in room-temperature water only for a minimum of 15 minutes.
	For both hot and cold burns: If required, cover the affected area with clean wet dressing or cloth and keep the dressing or cloth dripping wet with water until medical attention is obtained.
	DO NOT attempt to remove any clothing which has adhered to the skin. DO NOT apply any form of direct heat to any affected area. DO NOT apply any creams or lotions to any affected areas.
	Seek immediate medical attention for all burns, hot or cold.
Ingestion	For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor. Ingestion is considered unlikely due to product form.
Symptoms	In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of coordination. Direct contact with the liquefied gas or escaping compressed gas may cause cold burns.
Medical Attention & Special Treatment	Treat symptomatically. Severe inhalation over exposure may sensitise the heart to catecholamine induced arrhythmias. Do not administer catecholamines to an overexposed person.

	5. FIRE FIGHTING MEASURES
Extinguishing	 Evacuate the area of persons not directly involved in fighting the fire. Stop flow of gas if safe to do so, by closing valves or by activating the Emergency Shutdown (ESD) System. If the gas source cannot be isolated, <u>do NOT extinguish the flame</u>, since re-ignition of spilled gas (flash) could occur. Drench and cool cylinders or vessels with water spray from a protected area at a safe distance. If it is absolutely necessary to extinguish the flame, use only a dry chemical powder extinguisher. Carbon oxides (CO, CO₂) fumes may be produced should burning occur especially within an enclosed space. Fumes may be hazardous to personnel. Fire fighters should wear full protective clothing and be aware of the risk of possible explosion (ignition of spilled LPG, especially in a confined space). Flashback may occur along a vapour trail. Breathing apparatus is required in confined spaces. Where possible, remove cool cylinders from the path of the fire. Do not re-use a fire-exposed vessel or cylinder as heat damaged cylinders or vessels may have developed leaks in attached fittings. Seek advice from the supplier.
Specific Hazards	Highly flammable. Heating to decomposition produces acrid smoke and irritating fumes. Product will add fuel to a fire. Eliminate all ignition sources including cigarettes, open flames, spark producing switches / tools, heaters, naked lights, pilot lights, mobile phones etc. when handling.
Precautions for Fire Fighters	Highly flammable. Temperatures in a fire may cause cylinders or pressure vessels to rupture (BLEVE) and pressure relief devices to be activated (venting of LPG vapour to atmosphere, forming flammable clouds of air-gas mixture). Cool cylinders and vessels exposed to fire by applying water from a protected location and with water spray directing spray primarily onto the upper surface. Do not approach any LPG cylinder or vessel suspected of being hot.
Hazchem Code	2YE

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	If a tank or cylinder is leaking, eliminate all potential ignition sources (electrical equipment and tools, open flames / burners and cigarettes), evacuate area of personnel and activate the emergency shutdown system where fitted. If safe to so, hose the leaking tank or cylinder with water using a spray to dissipate the vapour. Contact the Emergency Services, and ELGAS on 1800 819 783 (24 hr centre). See Section 7 for more detail.
	For a small cylinder which is leaking, move the cylinder to an open area by carrying upright, evacuate the area of personnel, and spray the cylinder with water to dissipate the vapour. Contact the Emergency Services, and ELGAS in 1800 819 783 (24 hr centre).
	Never leave or move a leaking cylinder into a confined space (building, shed or vehicle) as vapour will collect in the confined space, creating several hazards. See Section 7 for more detail.
Environmental precautions	As this product has a very low flash point, any spillage or leak is a fire and / or explosion hazard. If a leak has not ignited, stop gas flow, isolate sources of ignition and evacuate personnel. Ensure good ventilation. Liquid leaks generate large volumes of heavier than air flammable vapour which may travel to remote sources of ignition (e.g. along drainage systems).

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Where appropriate, use water spray to disperse the gas or vapour and to protect
personnel attempting to stop leakage.
Vapour may collect in any confined space.

Methods of containment and cleaning up

Stop the flow of material, if this is without risk. If the leak cannot be stopped and the cylinder can be moved, move the cylinder to a safe and well-ventilated area, and allow to discharge.

Keep area evacuated of all personnel and free from ignition sources until any leaked or spilled liquid has evaporated. LPG is unlikely to contaminate water or soil.

7. HANDLING AND STORAGE

Precautions	Avoid inhalation of vapour.
for Safe	Avoid contact with liquid and cold storage containers.
Handling	Avoid contact with eyes.
	When handling cylinders wear protective footwear and suitable gloves.
	Always ensure that cylinders are within test date, are fit for use and are leak
	checked prior to use.
	Check for leaks by sound and smell and by locating with soapy water or with
	approved detection devices.
	the leak
	Ice formation is to be encouraged as it may reduce the severity of a liquid leak by
	obstructing the flow before the leak is isolated. (A very fine water mist delivered from
	a safe distance will promote ice formation around a liquid leak).
	Do not fill dented, gouged or rusty LPG cylinders vessels (refer AS 2337.1).
	Fill cylinders to 80% fill level (ullage tube via decanting or mass via mechanical
	filling).
	The maximum fill level for vessels is dependent upon their size and location as
	detailed in AS/NZS 1596.
	Use only equipment and pipework designed and approved (where applicable) for
	LPG as applications. Ensure that evidence cannot be struck by vehicles or by dropped or rolled objects
	etc
	Class 2.1 Flammable Gas products may only be loaded in the same vehicle or
	packed in the same freight container with the classes of products as permitted in the
	ADG Code (see references).
	Cylinders shall only be transported in an upright, secure position in accordance with
	the National Road Transport Commission Load Restraint Guide.
	Cylinders must not be dropped or impacted.
Conditions for	Stare and use only in yessels or exlinders designed for LPC service
Conditions for	Store and dispanse LPG only in well ventilated areas away from best and sources of
Sale Storage	ignition. Do not store in unventilated buildings
	Do not transport in unventilated vehicle compartments.
	Do not enter storage vessels. If entry to a vessel is necessary, contact the supplier.
	Cylinders and vessels must be properly labelled. Do not remove warning labels.
	LPG cylinders shall be stored in accordance with the requirements of AS/NZS 1596
	and AS 4332.
	Do not store in pits and basements where vapour may collect.
	Store cylinders securely in an upright position. Note: forklift cylinders may be stored
	Nonzontally. Store away from incompatible materials, particularly ovidising agonts. Chock yessels
	and cylinders are clearly labelled
	Do not contaminate cylinders or vessels with other products.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION
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Exposure Standards	Ingredient Name	Occupational Exposure Limits
	LPG	NOHSC TWA: 1000 ppm 8 hour(s)
	Butane	NOHSC TWA: 1900 mg/m ³ 8 hour(s) TWA: 800 ppm 8 hour(s)
	Propane	ACGIH TLV TWA: 1000 ppm 8 hour(s)
	Propene	ACGIH TLV TWA: 500 ppm 8 hour(s)
Engineering controls	Avoid inhalation. Use in well ventilated In poorly ventilated mechanical explosi Do not enter confin	ed areas. areas where flammable vapours may accumulate, ion proof extraction ventilation is recommended. led areas (e.g. tanks). Contact the supplier.
PPE: Eye & face protection Skin protection Respiratory protection	Wear safety goggles or face shield. Wear impervious and insulating gloves to prevent cold burns and frostbite Wear coverall clothing of the anti-static, low flame spread type. When handling cylinders, wear protective footwear. Where an inhalation risk exists, wear a Self-Contained Breathing Apparatus or Airline Respirator.	

9. PHYSICAL AND CHEMICAL PROPERTIES						
PROPERTY			PROF	PANE	BUT	ANE
Appearance		Colourle		ess Gas	Colour	less Gas
Odour			Characteris	tic Odour ⁽¹⁾	Characteris	stic Odour ⁽¹⁾
Odour Threshold			>5000) ppm	>500	0 ppm
Chemical Formula			C ₃	H ₈	C4H10	
Molecular Weight			44	.1	58.1	
Boiling Point			-42	2ºC	-0.5ºC	
Vapour Pressure at 40ºC			1530 kP	a (max)	520 kPa (max)	
		Li	iquid at 15ºC	Gas at 101 kPa & 15ºC	Liquid at 15ºC	Gas at 101 kPa & 15ºC
Density (kg/m ³)	-		510	1.86	568	2.47
Relative Density: water = 1.0 air = 1.0			0.510	1.53	0.568	2.00
Litres/tonne m ³ /tonne m ³ /m ³ of liquid			1961 1.961 1.000	536000 536 274	1760 1.760 1.000	405000 405 235
Specific heat of liquid (kJ/kg/ºC)			2.512		2.386	
Latent heat of vapourisation (MJ/m ³) (MJ/kg = GJ/t)			232 0.358		239 0.372	
Heat combustion (MJ/m ³) (MJ/kg = GJ/t)		:	25000 50.1	93.3 50.1	28800 49.47	121.9 49.47
Volume of air (m ³) needed to burn 1m ³ of gas				23.7		31.0
Flash point Auto-ignition temp.				-104ºC 450ºC		-60ºC 372ºC
Max. flame temp.				1970ºC		1990ºC
Flammability Limits of		E> fla	dremely mmable	Extremely flammable	Extremely flammable	Extremely flammable
flammability in air (% by vol): upper % lower %				9.6 2.4		8.6 1.9
Other Properties:			Solubility (wa	ater): 0.07cm ³ / cm ³	1	·
· Other name/numbers: LPG		UN 1075				
	Propane	!	UN 1978			
	Butane		UN 1011			
	IsoButar	ne	UN 1969			

An odourant is added to LPG to assist in detection of LPG vapour. In Australia, Ethyl Mercaptan is used as the odourant, which gives the LPG vapour a persistent and unpleasant smell of rotten cabbages, making LPG detectable by smell at levels well below the Lower Explosive Limit (LEL).

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	10. STABILITY AND REACTIVITY	
Reactivity	Extremely flammable. Reacts violently with oxidising agents.	
Chemical stability	Stable under recommended conditions of storage.	
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources.	
Incompatible materials	Incompatible with oxidising agents, acids, heat and ignition sources. Do not use natural rubber flexible hoses. Also incompatible (potentially violently) with oxygen, halogens and metal halides.	
Hazardous decomposition products	Heating to decomposition produces acrid smoke and irritating fumes.	

	11. TOXICOLOGICAL INFORMATION
Acute toxicity	Non toxic.
Skin corrosion/irritation	Non irritating. Contact with evaporating liquid or super-cold vessels or pipes may result in frost-bite with severe tissue injury.
Serious eye damage/irritation	Non irritating. Direct contact with evaporating liquid may result in severe cold burns with possible permanent tissue damage.
Respiratory or skin	Not classified as causing skin or respiratory sensitisation.
Germ cell mutagenicity	Not classified as a mutagen.
Carcinogenicity	Not classified as a carcinogen.
Reproductive toxicity	Not classified as a reproductive toxin.
Specific Target Organ Toxicity (STOT) – single exposure	Asphyxiant gas. Symptoms of exposure are directly related to displacement of oxygen from air. Low vapour concentrations may cause nausea, dizziness, headaches and drowsiness.
	High vapour concentrations may produce symptoms of oxygen deficiency which, coupled with central nervous system depression, may lead to rapid loss of consciousness, asphyxiation and fatal arrhythmia. May have a narcotic effect if high concentrations of vapour are inhaled.
Specific Target Organ Toxicity (STOT) – multiple exposure	Not classified as causing organ effects from repeated exposure.
Aspiration hazard	Not classified as an aspiration hazard.

	12. ECOLOGICAL INFORMATION
Eco Toxicity	Not toxic to flora, fauna or soil organisms. Will not cause long term adverse effects in the environment and is not dangerous to the ozone layer.
Persistence / Degradability	Unlikely to cause long term adverse effects in the environment.
Bio-accumulative potential	This material is not expected to bio-accumulate.
Mobility	Spillages are unlikely to penetrate the soil. The product is likely to volatise rapidly into the air.
Other Ecological Information	Unlikely to cause long term effects in the aquatic environment.

	13. DISPOSAL CONSIDERATIONS
Disposal methods	Cylinders should be returned to the manufacturer or supplier for disposal.
	Hazard warning labels are a guide to the safe handling of empty packaging and should not be removed. LPG cylinders or vessels should never be inadvertently disposed of in any land fill facility without being rendered visually and physically unusable before disposal.
	Warning: 'empty' tanks or cylinders can sometimes retain residue (LPG liquid and / vapour) and can be dangerous.
	DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL OR GRIND ANY CYLINDER OR TANK. DO NOT EXPOSE ANY CYLINDER OR TANK TO HEAT, FLAME, SPARKS AND OTHER SOURCES OF IGNITION. IGNITION OF LIQUID OR VAPOURS, INCLUDING RESIDUES, MAY CAUSE A FLASH OR EXPLOSION, RESULTING IN INJURY OR DEATH AND PROPERTY DAMAGE.

14. TRANSPORT INFORMATION	
UN Number	1075
Proper Shipping Name	PETROLEUM GASES, LIQUEFIED
Transport Hazard Class	2.1
Packing Group	None Allocated
Subsidiary Risk(s)	None Allocated
Environmental hazards for Transport Purposes	No
Special precautions for user	Do not transport with dangerous goods of Class 1, 3, 4, 5 and 7. Refer to ADG Code for detailed and specific restrictions.
Additional information	Transport of LPG is controlled in accordance with the requirements of the ADG Code and the National Transport Commission Load Restraint Guide.
Hazchem Code	See Section 5
15. REGULATORY INFORMATION

AICS All chemicals listed on the Australian Inventory of Chemical Substances (AICS).

Poison A poison schedule number has not been allocated to this product using the criteria in the **Schedule** Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

16. OTHER INFORMATION				
Principal Retail (Principal Retail Centres			
NSW Blacktown	22 Holbeche Road Blacktown NSW 2148 Phone: (02) 9672 0777 Fax: (02) 9672 1481	VIC Mulgrave	331-347 Police Road Mulgrave VIC 3170 Phone: (03) 9767 7222 Fax: (03) 9767 7372	
QLD Brisbane	Tanker Street Lytton QLD 4178 Phone: (07) 3396 2769 Fax: (07) 3893 1495	SA Adelaide	1 Newfield Road Para Hills West SA 5096 Phone: (08) 8368 4700 Fax: (08) 8349 4624	
ACT Canberra	3-5 Geelong Street Fyshwick ACT 2609 Phone: (02) 6280 6355 Fax: (02) 6280 4217	Swap 'n' Go	Contact the principal retail centre in your state or territory	
WA Perth	Unit 9 Level 1, 50 William St Beckenham WA 6107 Phone: (08) 6258 9900 Fax: (08) 9351 8888	Stargas	Contact the principal retail centre in your state or territory	
NT Darwin	1227 Winnellie Road Winnellie NT 0821 Phone: (08) 8947 4256			
Abbreviations	ACGIH = American Conference of Governmental Industrial Hygienists			
	ADG Code = Australian Code for the Transport of Dangerous Goods by Road and Rail			
	CAS Number = Chemical Abstracts Service Registry Number			
	GHS = Globally Harmonised System of Classifying and Labelling of Chemicals (published by the United Nations)			
	HAZCHEM Code = Emergency action code of numbers and letters which gives information to emergency services			
	NOHSC = National Occupational Health & Safety Commission, Australia			
	ppm = Parts Per Million			
	SDS = Safety Data Sheet			
	TLV = Threshold Limit Value			
	TWA = Time Weighted Average			
	STEL = Short-Term Exposure Limit			
	UN Number = United Nations Number, a four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods			
Revision History	1. October 2016 – full review for compliance to GHS and the Safe Work Australia SDS Code of Practice 2011.			
	 2. March 2018 – review and subsequent update of First-Aid and emergency response procedures. 3. January 2019 - auto-ignition temperatures and response to LPG leaks updated 			

SAFETY DATA SHEET

Revision date: 03-May-2023



Revision Number 7

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier		
Product Name	CAUSTIC SODA - LIQUID (5%-45%)	
Product Code(s)	000033985001	
Other means of identification		
UN number	1824	
Synonyms	Sodium hydroxide - liquid (20%-30%), Soda lye solution (20%-30%), Caustic soda solution (20%-30%), Sodium hydroxide solution (20%-30%), Liquid caustic soda (20%-30%), Caustic soda 10%, Caustic soda - liquid 17%, Caustic soda solution 17%, Liquid caustic soda 17%, Caustic soda 5%, Aluminux LL; Sodium hydroxide 2.4N; Caustic Soda 5% low chlorate; Sodium hydroxide 2.0N.	
Recommended use of the chemic	cal and restrictions on use	
Recommended use	Chemical and explosives manufacture; neutralising agent.	
Uses advised against	No information available	
Supplier		

Ixom Operations Pty Ltd ABN: 51 600 546 512 Level 8, 1 Nicholson Street Melbourne 3000 Australia

Telephone Number: +61 3 9906 3000

Emergency telephone number

Emergency telephone number

1 800 033 111 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Corrosive to metals	Category 1
Skin corrosion/irritation	Category 1 Sub-category A
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3

SIGNAL WORD Danger





Hazard statements

H290 - May be corrosive to metals H314 - Causes severe skin burns and eye damage H335 - May cause respiratory irritation

Precautionary Statements - Prevention

Keep only in original container Do not breathe fume, gas, mist, vapours, spray Wash face, hands and any exposed skin thoroughly after handling Use only outdoors or in a well-ventilated area Wear protective gloves / protective clothing / eye protection / face protection **Precautionary Statements - Response** Specific treatment (see First aid on this SDS) 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 doctor/physician IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower Wash contaminated clothing before reuse Get immediate medical advice/attention IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing Call a POISON CENTER or doctor/physician if you feel unwell IF SWALLOWED: Rinse mouth. DO NOT induce vomiting Absorb spillage to prevent material damage **Precautionary Statements - Storage** Store in a well-ventilated place. Keep container tightly closed Store locked up Store in corrosion resistant container with a resistant inner liner **Precautionary Statements - Disposal**

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other hazards which do not result in classification General Hazards

Poisons Schedule (SUSMP)

3. COMPOSITION/INFORMATION ON INGREDIENTS

6

<u>Mixture</u>

Chemical name	CAS No.	Weight-%
Sodium hydroxide	1310-73-2	5-45
Water	7732-18-5	to 100

Description of first aid measures

General advice	For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Show this safety data sheet to the doctor in attendance.		
Inhalation	Remove to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.		
Eye contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.		
Skin contact	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER or doctor/physician.		
Ingestion	Rinse mouth thoroughly with water. Do NOT induce vomiting. Drink 1 or 2 glasses of water. Get immediate medical advice/attention.		
Most important symptoms and effec	ts, both acute and delayed		
Symptoms	Irritation/Corrosion. May cause redness and tearing of the eyes. Erythema (skin redness). Burning. Coughing and/ or wheezing. Difficulty in breathing.		
Indication of any immediate medical	attention and special treatment needed		
Note to physicians	Treat symptomatically. Can cause corneal burns.		
5. FIRE FIGHTING MEASURES			
Suitable Extinguishing Media			
Suitable Extinguishing Media	Dry chemical, CO2, water spray or regular foam.		
Unsuitable extinguishing media	No information available.		
Specific hazards arising from the chemical			

Specific hazards arising from the
chemicalCorrosive hazard. Wear protective gloves/clothing and eye/face protection. Contact with
metals may evolve flammable hydrogen gas.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.
Hazchem code	2R

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Use personal protective equipment as required. Wash thoroughly after handling.	
For emergency responders	Use personal protection recommended in Section 8.	

Environmental precautions		
Environmental precautions	Local authorities should be advised if significant spillages cannot be contained.	
Methods and material for containment and cleaning up		
Methods for containment	Prevent further leakage or spillage if safe to do so.	
Methods for cleaning up	Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. After cleaning, flush away traces with water.	

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Avoid contact with skin and eyes. Do not breathe vapor or mist. Do not eat, drink or smoke when using this product. Keep out of reach of children. Ensure adequate ventilation. Use personal protection equipment. Wash thoroughly after handling.	
Conditions for safe storage, includin	ng any incompatibilities	
Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Store away from foodstuffs. Do not store in aluminium or galvanised containers nor use die-cast zinc or aluminium bungs; plastic bungs should be used. At temperatures greater than 40°C, tanks must be stress relieved. Keep container closed when not in use.	
	This material is a Scheduled Poison and must be stored, maintained and used in accordance with the relevant regulations.	
Packaging materials	Do not store in aluminium containers. Do not store in tin containers. Do not store in zinc containers.	
Incompatible materials	Ammonium salts. Aluminium. Tin. Zinc. Strong acids.	

Poisons Schedule (SUSMP)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

6

Control parameters

Exposure Limits

No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Sodium hydroxide: Peak Limitation = 2 mg/m³

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

Peak Limitation - a maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time which does not exceed 15 minutes.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Ensure that eyewash stations and safety showers are close to the workstation location. Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, CHEMICAL GOGGLES, FACE SHIELD, GLOVES (Long), APRON, RUBBER BOOTS.

Eye/face protection	Tight sealing safety goggles. If splashes are likely to occur:. Face protection shield.	
Skin and body protection	Boots. Apron. Overalls.	
Hand protection	Elbow-length impervious gloves.	
Respiratory protection	If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.	
Environmental exposure controls	No information available.	

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Liquid	
Appearance	Clear to Slightly turbid	
Color	Colourless	
Odor	Not specified	
Odor threshold	No information available	
Property_	Values	Remarks • Method
pH	>10.5 (1% sol.)	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	119°C (25%)	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	Not applicable	
Lower flammability or explosive limits	Not applicable	

Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.056-1.483 @20°C	None known
Water solubility	Miscible in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	Not applicable	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Other information		
10. STABILITY AND REAC	ΤΙVITY	
Reactivity		
Reactivity	Reacts with strong acids.	
Chemical stability		

Stability

Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Possibility of hazardous reactions Contact with metals (aluminum, zinc, tin) may release hydrogen gas. Reacts with ammonium salts, evolving ammonia gas. Reacts readily with various reducing sugars (i.e. fructose, galactose, maltose, dry whey solids) to produce carbon monoxide. Take precautions including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.

Do not contaminate food or feed stuffs.

Conditions to avoid

Conditions to avoid

Incompatible materials

Incompatible materials Ammonium salts. Aluminium. Tin. Zinc. Strong acids.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information	No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:	
Inhalation	Irritating to respiratory system.	

Eye contact	Causes serious eye damage.
Skin contact	Contact causes severe skin irritation and possible burns.
Ingestion	Can burn mouth, throat, and stomach.
Symptoms	Irritation/Corrosion. May cause redness and tearing of the eyes. Erythema (skin redness). Burning. Coughing and/ or wheezing. Difficulty in breathing.

Numerical measures of toxicity - Product Information

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Sodium hydroxide	-	= 1350 mg/kg (Rabbit)	-

See section 16 for terms and abbreviations

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

Skin corrosion/irritation	Causes burns. Classification is based on mixture calculation methods based on component data.
Serious eye damage/eye irritation	Causes serious eye damage. Classification is based on mixture calculation methods based on component data.
Respiratory or skin sensitization	No information available.
Germ cell mutagenicity	No information available.
Carcinogenicity	No information available.
Reproductive toxicity	No information available.
STOT - single exposure	May cause respiratory irritation. Classification is based on mixture calculation methods based on component data.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity

Keep out of waterways.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Sodium hydroxide	-	LC50: =45.4mg/L (96h,	-	-
		Oncorhynchus mykiss)		

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential		
Bioaccumulation	No information available.	
<u>Mobility</u>		
Mobility in soil	No information available.	
Other adverse effects		
13. DISPOSAL CONSI	DERATIONS	

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

<u>ADG</u>

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN number	1824
Proper shipping name	SODIUM HYDROXIDE SOLUTION
Hazard class	8
Packing group	II
Hazchem code	2R

<u>IATA</u>

Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS.

UN number	1824
UN proper shipping name	SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)	8
Packing group	II

<u>IMDG</u>

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	1824
UN proper shipping name	SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)	8
Packing group	II
IMDG EMS Fire	F-A
IMDG EMS Spill	S-B
Marine pollutant	No

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)

Classified as a scheduled poison according to the Standard for Uniform Scheduling of Medicines and Poisons (SUSMP) **Poisons Schedule (SUSMP)** 6

 International Inventories

 AIIC
 All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

 NZIoC
 All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

Legend: AllC- Australian Inventory of Industrial Chemicals NZIOC - New Zealand Inventory of Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date:

03-May-2023

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend	Section 8: EXPOSURE CONTROL S/PERSONAL	PROTECTION
TWA	TWA (time-weighted average)	STEL
Ceiling	Maximum limit value	*
С	Carcinogen	

STEL (Short Term Exposure Limit) Skin designation

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)

Acute Exposure Guideline Level(s) (AEGL(s))

U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act

U.S. Environmental Protection Agency High Production Volume Chemicals

Food Research Journal Hazardous Substance Database International Uniform Chemical Information Database (IUCLID) Japan GHS Classification Australian Industrial Chemicals Introduction Scheme (AICIS) NIOSH (National Institute for Occupational Safety and Health) National Library of Medicine's ChemID Plus (NLM CIP) National Library of Medicine's PubMed database (NLM PUBMED) National Toxicology Program (NTP) New Zealand's Chemical Classification and Information Database (CCID) Organization for Economic Co-operation and Development Environment, Health, and Safety Publications Organization for Economic Co-operation and Development High Production Volume Chemicals Program Organization for Economic Co-operation and Development Screening Information Data Set RTECS (Registry of Toxic Effects of Chemical Substances) World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name:

SULFURIC ACID >10% - 51%

Other name(s):Sulphuric acid >10%-51%; Sulfuric acid battery (>10% - 51%); Sulphuric acid battery
>10% - 51%.

Recommended Use of the Chemical Manufacture of lead-acid battery cells. **and Restrictions on Use**

Supplier:	Ixom Operations Pty Ltd	
ABN:	51 600 546 512	
Street Address:	Level 8, 1 Nicholson Street	
	East Melbourne Victoria 3002	
	Australia	
Telephone Number:	+61 3 9906 3000	
Emergency Telephone:	1 800 033 111 (ALL HOURS)	

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:

Skin Corrosion - Sub-category 1A Eye Damage - Category 1 Specific target organ toxicity (single exposure) - Category 3

SIGNAL WORD: DANGER



Hazard Statement(s): H290 May be corrosive to metals. H314 Causes severe skin burns and eye damage. H335 May cause respiratory irritation.

Precautionary Statement(s):

Prevention:

P234 Keep only in original container.
P260 Do not breathe mist, vapours, spray.
P264 Wash hands thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves / protective clothing / eye protection / face protection.

Safety Data Sheet



Response:

P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P321 Specific treatment (see First Aid Measures on Safety Data Sheet).
P363 Wash contaminated clothing before re-use.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 Call a POISON CENTER or doctor/physician if you feel unwell.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/physician.
P390 Absorb spillage to prevent material damage.

Storage:

P403+P233 Store in a well-ventilated place. Keep container tightly closed.

P405 Store locked up.

P406 Store in corrosive resistant container with a resistant inner liner.

Disposal:

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

Poisons Schedule (SUSMP): S6 Poison.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Sulfuric acid	7664-93-9	>10-51%	H290, H314, H318
Water	7732-18-5	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. If patient finds breathing difficult and develops a bluish discolouration of the skin (which suggests a lack of oxygen in the blood - cyanosis), ensure airways are clear of any obstruction and have a qualified person give oxygen through a face mask. Apply artificial respiration if patient is not breathing. Seek immediate medical advice.

Skin Contact:

If spilt on large areas of skin or hair, immediately drench with running water and remove clothing. Continue to wash skin and hair with plenty of water (and soap if material is insoluble) until advised to stop by the Poisons Information Centre or a doctor. For skin burns, cover with a clean, dry dressing until medical help is available.

Eye Contact:

SPEED IS ESSENTIAL. Immediately wash in and around the eye area with large amounts of water for at least 15 minutes. Eyelids to be held apart. Remove clothing if contaminated and wash skin. Urgently seek medical assistance. Transport promptly to hospital or medical centre.

Ingestion:

Immediately rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically. Can cause corneal burns. Product Name: SULFURIC ACID >10% - 51% Substance No: 000033615201

Issued: 29/07/2019 Version: 6



5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Hazchem or Emergency Action Code: 2R

Specific hazards arising from the chemical:

Non-combustible material. Corrosive substance.

Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of sulfur dioxide . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact and breathing in vapours. Work up wind or increase ventilation. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Collect and seal in properly labelled containers or drums for disposal. Neutralise residues with lime or soda ash. Wash area down with excess water.

7. HANDLING AND STORAGE

This material is a Scheduled Poison S6 and must be stored, maintained and used in accordance with the relevant regulations.

Precautions for safe handling:

Avoid skin and eye contact and breathing in vapour, mists and aerosols. Keep out of reach of children. Always add the acid to water, never the reverse. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities:

Store in a cool, dry, well ventilated place. Store away from foodstuffs. Store away from incompatible materials described in Section 10. Keep dry - reacts with water, may lead to drum rupture. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters: No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Sulfuric acid: 8hr TWA = 1 mg/m³, 15 min STEL = 3 mg/m^3

Safety Data Sheet



As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, CHEMICAL GOGGLES, FACE SHIELD, GLOVES (Long), APRON, RUBBER BOOTS.



Wear overalls, chemical goggles, face shield, elbow-length impervious gloves, splash apron or equivalent chemical impervious outer garment, and rubber boots. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

If determined by a risk assessment an inhalation risk exists, wear an acid mist respirator or an air-supplied respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Colourless to Brown
Odour:	Odourless
Solubility:	Miscible with water , and alcohol.
Specific Gravity:	1.25 - 1.40
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	<0.0001 kPa

Product Name: SULFURIC ACID >10% - 51% Substance No: 000033615201 Issued: 29/07/2019 Version: 6

Safety Data Sheet



Not applicable
Not applicable
Not applicable
127
<1

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with alkalis.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Corrosive to most metals. Reacts exothermically with water .
Conditions to avoid:	Avoid exposure to moisture.
Incompatible materials:	Incompatible with many metals, organic chemicals, alkalis.
Hazardous decomposition products:	Sulfur dioxide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain and chemical burns to the gastrointestinal tract.
Eye contact:	A severe eye irritant. Corrosive to eyes; contact can cause corneal burns. Contamination of eyes can result in permanent injury.
Skin contact:	Contact with skin will result in severe irritation. Corrosive to skin - may cause skin burns.
Inhalation:	Breathing in mists or aerosols will produce respiratory irritation.
Acute toxicity: No LD50 data a Oral LD50 (rat): 2140 mg/kg	available for the product. For the constituent Sulfuric acid (1):

Inhalation LC50 (rat): 510 mg/m³/2hours

Respiratory or skin No information available. sensitisation:

Chronic effects: No information available for the product.

For the component Sulfuric acid: Repeated overexposure may lead to chronic conjunctivitus, lung damage and dental erosion. The International Agency for Research on Cancer (IARC) have concluded that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans, causing cancer of the larynx and to a lesser extent, the lung. No direct link has been established with sulfuric acid, itself, and cancer in humans. Exposure to any mist or aerosol during the use of this product should be avoided and exposure should not exceed the exposure standard. (2)

Aspiration hazard:

No information available.



12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to Waste Management Authority. Dispose of contents and container in accordance with local, regional, national, international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.



UN No:	2796
Transport Hazard Class:	8 Corrosive
Packing Group:	II
Proper Shipping Name or	BATTERY FLUID, ACID
Technical Name:	
Hazchem or Emergency Action	2R
Code:	

Marine Transport

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN No: Transport Hazard Class: Packing Group: Proper Shipping Name or Technical Name:	2796 8 Corrosive II BATTERY FLUID, ACID
IMDG EMS Fire:	F-A
IMDG EMS Spill:	S-B

Air Transport

Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS.

UN No:	27	'96
Transport Hazard Class:	8	Corrosive
Packing Group:	II	

Product Name: SULFURIC ACID >10% - 51% Substance No: 000033615201

Safety Data Sheet



Proper Shipping Name or BATTERY FLUID, ACID Technical Name:

15. REGULATORY INFORMATION

Classification:

This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:

Skin Corrosion - Sub-category 1A Eye Damage - Category 1 Specific target organ toxicity (single exposure) - Category 3

Hazard Statement(s):

H290 May be corrosive to metals. H314 Causes severe skin burns and eye damage. H335 May cause respiratory irritation.

Poisons Schedule (SUSMP): S6 Poison.

All the constituents of this material are listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

(1) `Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinatti, 2019.

(2) International Agency for Research on Cancer. In: `IARC Monographs on the Evaluation of Carcinogenic Risk to Humans'. World Health Organisation, 1992.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

Revision date: 20-Mar-2023



Revision Number 13

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier	
Product Name	SODIUM HYPOCHLORITE SOLUTION (10-15% AVAILABLE CHLORINE)
Product Code(s)	000034421401
Other means of identification	
UN number	1791
Recommended use of the chemical	and restrictions on use
Recommended use	Water treatment chemical. Sanitiser.
Uses advised against	No information available
Supplier Ixom Operations Pty Ltd ABN: 51 600 546 512 Level 8, 1 Nicholson Street Melbourne 3000 Australia	
Telephone Number: +61 3 9906 3000	

Emergency telephone number

Emergency telephone number

1 800 033 111 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Skin corrosion/irritation	Category 1 Sub-category B
Serious eye damage/eye irritation	Category 1
Acute aquatic toxicity	Category 1
Chronic aquatic toxicity	Category 1

SIGNAL WORD Danger

Label elements

Corrosion



Hazard statements

H314 - Causes severe skin burns and eye damage

The following health/environmental hazard categories fall outside the scope of the Workplace Health and Safety Regulations: H410 - Very toxic to aquatic life with long lasting effects

Precautionary Statements - Prevention

Do not breathe fume, gas, mist, vapours, spray Wash face, hands and any exposed skin thoroughly after handling Wear protective gloves / protective clothing / eye protection / face protection Avoid release to the environment **Precautionary Statements - Response** Specific treatment (see First aid on this SDS) 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 doctor/physician IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower Wash contaminated clothing before reuse Immediately call a POISON CENTER or doctor IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing Immediately call a POISON CENTER or doctor/physician IF SWALLOWED: Rinse mouth. DO NOT induce vomiting Collect spillage **Precautionary Statements - Storage** Store locked up **Precautionary Statements - Disposal** Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other hazards which do not result in classification

AUH031 - Contact with acids liberates toxic gas Very toxic to aquatic life with long lasting effects

Poisons Schedule (SUSMP)

3. COMPOSITION/INFORMATION ON INGREDIENTS

5

Mixture

Chemical name	CAS No.	Weight-%
Sodium hypochlorite	7681-52-9	10-<30
Sodium hydroxide	1310-73-2	<1
Non hazardous component(s)	-	to 100

4. FIRST AID MEASURES

Description of first aid measures

General advice

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Show this safety data sheet to the doctor in attendance.

Inhalation	Remove to fresh air. Call a physician if symptoms occur.
Eye contact	Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.
Skin contact	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER or doctor/physician.
Ingestion	Rinse mouth thoroughly with water. Do NOT induce vomiting. Drink 1 or 2 glasses of water. Get immediate medical advice/attention.

Most important symptoms and effects, both acute and delayed

Symptoms	Irritation/Corrosion. May cause redness and tearing of the eyes. Erythema (skin redness).
	Burning.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Can cause corneal burns. Delayed pulmonary edema may occur.

D. FIRE FIGHTING MEASU	KEO
Suitable Extinguisting Media	
Suitable Extinguishing Media	Dry chemical, CO2, water spray or regular foam.
Unsuitable extinguishing media	
Specific hazards arising from the cl	hemical
Specific hazards arising from the chemical	Corrosive hazard. Wear protective gloves/clothing and eye/face protection. Environmentally hazardous. Non-combustible.
Special protective actions for fire-fi	<u>ghters</u>
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.
Hazchem code	2X
6. ACCIDENTAL RELEASE	MEASURES
Personal precautions, protective eq	uipment and emergency procedures
Personal precautions	Avoid contact with skin, eyes, and clothing. Do not breathe vapor or mist. Do not touch or walk through spilled material. Evacuate personnel to safe areas. Use personal protective equipment as required. Wash thoroughly after handling.
For emergency responders	Use personal protection recommended in Section 8.
Environmental precautions	
Environmental precautions	Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for cleaning up	Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

Precautions for safe handling

Advice on safe handling Do not breathe vapor or mist. Avoid contact with skin, eyes, and clothing. Do not eat, drink or smoke when using this product. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Store away from foodstuffs. Keep container closed when not in use.
	This material is a Scheduled Poison and must be stored, maintained and used in accordance with the relevant regulations.
Incompatible materials	Acids. Metals. Metal salts. Peroxides. Reducing agents. Ethylene diamine tetraacetic acid. Methanol. Urea. Ammonia. Ammonium compounds. Aziridine.

Poisons Schedule (SUSMP)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

5

Control parameters

Exposure Limits

No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s) and decomposition product(s):

Sodium hydroxide: Peak Limitation = 2 mg/m³ Chlorine: Peak Limitation = 3 mg/m³ (1 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

Peak Limitation - a maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time which does not exceed 15 minutes.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

 Engineering controls
 Ensure that eyewash stations and safety showers are close to the workstation location.

 Apply technical measures to comply with the occupational exposure limits.

 If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and

the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, CHEMICAL GOGGLES, FACE SHIELD, GLOVES (Long), APRON, RUBBER BOOTS.



9. PHYSICAL AND CHEMICAL PROPERTIES

|--|

Physical state	Liquid	
Appearance	No information available	
Color	Pale Yellow - Green	
Odor	Chlorine	
Odor threshold	No information available	
Property	Values	Remarks • Method
pH	12.5(1% w/w)	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	Not applicable	
Lower flammability or explosive	Not applicable	
limits		
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.2 @20°C	None known
Water solubility	Miscible in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known

Revision Number 13

Autoignition temperature
Decomposition temperature
Kinematic viscosity
Dynamic viscosity

No data available No data available No data available No data available None known None known None known

Other information

10. STABILITY AND REACTIVITY

Reactivity	
Reactivity	Contact with acids liberates toxic gas.
Chemical stability	
Stability	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. The amount of available chlorine diminishes over time.
Explosion data Sensitivity to mechanical impac	t None.
Sensitivity to static discharge	None.
Possibility of hazardous reactions	
Possibility of hazardous reactions	Can react with ammonia, amines, or ammonium salts to produce chloramines.
Hazardous polymerization	Hazardous polymerization does not occur.
Conditions to avoid	
Conditions to avoid	Exposure to light. Do not contaminate food or feed stuffs.
Incompatible materials	
Incompatible materials	Acids. Metals. Metal salts. Peroxides. Reducing agents. Ethylene diamine tetraacetic acid. Methanol. Urea. Ammonia. Ammonium compounds. Aziridine.

Hazardous decomposition products

Hazardous decomposition products Chlorine.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information	No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:
Inhalation	May cause irritation. Delayed (up to 48hours) fluid build up in the lungs may occur.
Eye contact	Causes serious eye damage.
Skin contact	Contact causes severe skin irritation and possible burns.
Ingestion	Can burn mouth, throat, and stomach.

Symptoms

Irritation/Corrosion. May cause redness and tearing of the eyes. Erythema (skin redness). Burning.

Numerical measures of toxicity - Product Information

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Sodium hypochlorite	= 8.91 g/kg (Rat)	> 10000 mg/kg (Rabbit)	-
Sodium hydroxide	-	= 1350 mg/kg (Rabbit)	-

See section 16 for terms and abbreviations

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

Skin corrosion/irritation	Causes burns. Classification is based on mixture calculation methods based on component data.
Serious eye damage/eye irritation	Causes serious eye damage. Classification is based on mixture calculation methods based on component data.
Respiratory or skin sensitization	No information available.
Germ cell mutagenicity	No information available.
Carcinogenicity	Refer to 'Chronic effects' section below.
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Hypochlorite salts have been classified by the International Agency for Research on Cancer (IARC) as a Group 3 -Not classifiable as to its carcinogenicity to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity

Keep out of waterways. Very toxic to aquatic life with long lasting effects.

Chemical name	Algae/aquatic plants	Fish	Toxicity to	Crustacea
			microorganisms	
Sodium hypochlorite	EC50: =0.095mg/L (24h,	LC50: 0.06 - 0.11mg/L	-	EC50: 0.033 - 0.044mg/L
	Skeletonema costatum)	(96h, Pimephales		(48h, Daphnia magna)
		promelas) LC50: 4.5 -		EC50: =2.1mg/L (96h,
		7.6mg/L (96h,		Daphnia magna)
		Pimephales promelas)		
		LC50: 0.4 - 0.8mg/L (96h,		
		Lepomis macrochirus)		
		LC50: 0.28 - 1mg/L (96h,		
		Lepomis macrochirus)		

000034421401 - SODIUM HYPOCHLORITE SOLUTION (10-15% AVAILABLE CHLORINE)

		LC50: 0.05 - 0.771mg/L (96h, Oncorhynchus mykiss) LC50: 0.03 - 0.19mg/L (96h, Oncorhynchus mykiss) LC50: 0.18 - 0.22mg/L (96h, Oncorhynchus		
Sodium hydroxide	-	LC50: =45.4mg/L (96h, Oncorhynchus mykiss)	-	-
Persistence and degradability Biodegradable.				
Bioaccumulative potenti Bioaccumulation	al Material does	s not bioaccumulate.		
Mobility No information available. Other adverse effects No information available.				
Mobility in soil No information available. Other adverse effects				

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

<u>ADG</u>

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN number	1791
Proper shipping name	HYPOCHLORITE SOLUTION
Hazard class	8
Packing group	II
Hazchem code	2X

<u>IATA</u>

Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS.

UN number	1791
UN proper shipping name	HYPOCHLORITE SOLUTION
Transport hazard class(es)	8
Packing group	II

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	1791
UN proper shipping name	HYPOCHLORITE SOLUTION
Transport hazard class(es)	8
Packing group	II
IMDG EMS Fire	F-A
IMDG EMS Spill	S-B
Marine pollutant	Yes

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)Classified as a scheduled poison according to the Standard for Uniform Scheduling of Medicines and Poisons (SUSMP)Poisons Schedule (SUSMP)5

International Inventories	
AIIC	All the constituents of this material are listed on the Australian Inventory of Industrial
	Chemicals.

Legend: AIIC- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Reason(s) For Issue: Revised Primary SDS Updated Formulation

Issuing Date:

20-Mar-2023

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legena Sec	tion 8: EXPOSURE CONTROLS/PERSONAL	PROTECTION	
TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		-

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency) Acute Exposure Guideline Level(s) (AEGL(s)) U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act U.S. Environmental Protection Agency High Production Volume Chemicals Food Research Journal Hazardous Substance Database International Uniform Chemical Information Database (IUCLID) Japan GHS Classification Australian Industrial Chemicals Introduction Scheme (AICIS) NIOSH (National Institute for Occupational Safety and Health) National Library of Medicine's ChemID Plus (NLM CIP) National Library of Medicine's PubMed database (NLM PUBMED) National Toxicology Program (NTP) New Zealand's Chemical Classification and Information Database (CCID) Organization for Economic Co-operation and Development Environment, Health, and Safety Publications Organization for Economic Co-operation and Development High Production Volume Chemicals Program Organization for Economic Co-operation and Development Screening Information Data Set RTECS (Registry of Toxic Effects of Chemical Substances)

World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since lxom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet



Ammonia Solution 25% w/w ALPHA CHEMICALS PTY LTD

Chemwatch: 22-1116 Version No: 3.1.1.1 Safety Data Sheet according to WHS and ADG requirements Chemwatch Hazard Alert Code: 3

Issue Date: 01/11/2019 Print Date: 12/01/2021 S.GHS.AUS.EN

SECTION 1 Identification of the substance / mixture and of the company / undertaking

Product Identifier

Product name	Ammonia Solution 25% w/w
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia (contains ammonium hydroxide)
Chemical formula	Not Applicable
Other means of identification	Not Available

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

Polovant identified uses	Use according to manufacturer's directions.
Relevant luentineu uses	The use of a quantity of material in an unventilated of confined space may result in increased exposure and an initiating atmosphere developing.
	Before starting consider control of exposure by mechanical ventilation.

Details of the supplier of the safety data sheet

Registered company name	ALPHA CHEMICALS PTY LTD
Address	4 ALLEN PLACE WETHERILL PARK NSW 2099 Australia
Telephone	61 (0)2 9982 4622
Fax	Not Available
Website	2
Email	shane@alphachem.com.au

Emergency telephone number

• • •	
Association / Organisation	ALPHA CHEMICALS PTY LTD
Emergency telephone numbers	61 (0)418 237 771
Other emergency telephone numbers	Not Available

SECTION 2 Hazards identification

Classification of the substance or mixture

HAZARDOUS CHEMICAL. DANGEROUS GOODS. According to the WHS Regulations and the ADG Code.

ChemWatch Hazard Ratings

	Min	Max	1
Flammability	0		1
Toxicity	3		0 = Minimum
Body Contact	3		1 = Low
Reactivity	2		2 = Moderate
Chronic	0		3 = High 4 = Extreme

Poisons Schedule	S6
Classification ^[1]	Metal Corrosion Category 1, Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 3, Skin Corrosion/Irritation Category 1B, Serious Eye Damage Category 1, Acute Aquatic Hazard Category 1
Legend:	1. Classified by Chernwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI



Signal word Danger

Hazard statement(s)

H290	May be corrosive to metals.
H302	Harmful if swallowed.
H331	Toxic if inhaled.
H314	Causes severe skin burns and eye damage.
H400	Very toxic to aquatic life.

Precautionary statement(s) Prevention

P260	Do not breathe mist/vapours/spray.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P234	Keep only in original container.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.

Precautionary statement(s) Response

P301+P330+P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.
P321	Specific treatment (see advice on this label).
P363	Wash contaminated clothing before reuse.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P390	Absorb spillage to prevent material damage.

Precautionary statement(s) Storage

P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary statement(s) Disposal

P501

Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
1336-21-6	30-60	ammonium hydroxide
Not Available	balance	ingredients determined not to be hazardous
7664-41-7	10-30	ammonia anhydrous liquefied

SECTION 4 First aid measures

Description of first aid measures

Eye Contact	 If this product comes in contact with the eyes: Immediately hold eyelids apart and flush the eye continuously with running water. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	 If skin or hair contact occurs: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre. Transport to hospital, or doctor.

Inhalation	 If fumes or combustion products are inhaled remove from contaminated area. Lay patient down. Keep warm and rested. Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. Transport to hospital, or doctor, without delay. Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema. Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs). As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested. Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered. This must definitely be left to a doctor or person authorised by him/her.
Ingestion	 For advice, contact a Poisons Information Centre or a doctor at once. Urgent hospital treatment is likely to be needed. If swallowed do NOT induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

Indication of any immediate medical attention and special treatment needed

For acute or short-term repeated exposures to highly alkaline materials:

Respiratory stress is uncommon but present occasionally because of soft tissue edema.

- Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
- Oxvgen is given as indicated.
- ▶ The presence of shock suggests perforation and mandates an intravenous line and fluid administration.

Damage due to alkaline corrosives occurs by liquefaction necrosis whereby the saponification of fats and solubilisation of proteins allow deep penetration into the tissue.

Alkalis continue to cause damage after exposure. INGESTION:

Milk and water are the preferred diluents

No more than 2 glasses of water should be given to an adult.

Neutralising agents should never be given since exothermic heat reaction may compound injury.

* Catharsis and emesis are absolutely contra-indicated.

* Activated charcoal does not absorb alkali.

* Gastric lavage should not be used.

Supportive care involves the following:

- Withhold oral feedings initially.
- If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
- Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
- Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).

SKIN AND EYE:

Injury should be irrigated for 20-30 minutes.

- Eye injuries require saline. [Ellenhorn & Barceloux: Medical Toxicology]
- for irritant gas exposures:
- + the presence of the agent when it is inhaled is evanescent (of short duration) and therefore, cannot be washed away or otherwise removed
- arterial blood gases are of primary importance to aid in determination of the extent of damage. Never discharge a patient significantly exposed to an irritant gas without obtaining an arterial blood sample.
- supportive measures include suctioning (intubation may be required), volume cycle ventilator support (positive and expiratory pressure (PEEP), steroids and antibiotics, after a culture is taken
- ▶ If the eyes are involved, an ophthalmologic consultation is recommended

Occupational Medicine: Third Edition; Zenz, Dickerson, Horvath 1994 Pub: Mosby

For acute or short term repeated exposures to ammonia and its solutions:

- Mild to moderate inhalation exposures produce headache, cough, bronchospasm, nausea, vomiting, pharyngeal and retrosternal pain and conjunctivitis. Severe inhalation produces laryngospasm, signs of upper airway obstruction (stridor, hoarseness, difficulty in speaking) and, in excessively, high doses, pulmonary oedema.
- Warm humidified air may soothe bronchial irritation.
- Test all patients with conjunctival irritation for corneal abrasion (fluorescein stain, slit lamp exam)
- Dyspneic patients should receive a chest X-ray and arterial blood gases to detect pulmonary oedema.

SECTION 5 Firefighting measures

Extinguishing media

- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

Special hazards arising from the substrate or mixture

 Fire Incompatibility
 None known.

 Advice for firefighters
 Image: Comparison of the firefighters

Autor for menginers		
Fire Fighting	 Alert Fire Brigade and tell them location and nature of hazard. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water course. Use fire fighting procedures suitable for surrounding area. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. 	

Fire/Explosion Hazard	 Non combustible. Not considered a significant fire risk, however containers may burn. Decomposition may produce toxic fumes of: nitrogen oxides (NOx) Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions. May emit corrosive fumes.
HAZCHEM	2X

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	 Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material. Check regularly for spills and leaks. Clean up all spills immediately. Avoid breathing vapours and contact with skin and eyes. Control personal contact with the substance, by using protective equipment. Contain and absorb spill with sand, earth, inert material or vermiculite. Wipe up. Place in a suitable, labelled container for waste disposal.
Major Spills	 DO NOT touch the spill material Clear area of personnel and move upwind. Alert Fire Brigade and tell them location and nature of hazard. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water course. Stop leak if safe to do so. Contain spill with sand, earth or vermiculite. Collect recoverable product into labelled containers for recycling. Neutralise/decontaminate residue (see Section 13 for specific agent).

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	Contains low boiling substance: Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately. Check for bulging containers. Vent periodically Always release caps or seals slowly to ensure slow dissipation of vapours DO NOT allow clothing wet with material to stay in contact with skin Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Avoid contact with moisture. Avoid contact with incompatible materials. When handling, DO NOT eat, drink or smoke. Keep containers securely sealed when not in use. Avoid physical damage to containers.
Other information	 Store in original containers. Keep containers securely sealed. Store in a cool, dry, well-ventilated area. Store away from incompatible materials and foodstuff containers. Protect containers against physical damage and check regularly for leaks. Observe manufacturer's storage and handling recommendations contained within this SDS. DO NOT store near acids, or oxidising agents No smoking, naked lights, heat or ignition sources.

Conditions for safe storage, including any incompatibilities

Suitable container	 DO NOT use aluminium, galvanised or tin-plated containers DO NOT use unlined steel containers Lined metal can, lined metal pail/ can. Plastic pail. Polyliner drum. Packing as recommended by manufacturer. Check all containers are clearly labelled and free from leaks. For low viscosity materials Drums and jerricans must be of the non-removable head type. Where a can is to be used as an inner package, the can must have a screwed enclosure. For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.): Removable head packaging; Cans with friction closures and low pressure tubes and cartridges may be used.

	Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.
Storage incompatibility	 Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous For ammonia: Ammonia forms explosive mixtures with oxygen, chlorine, bromine, fluorine, iodine, mercury, platinum and silver. Fire and/or explosion may follow contact with acetaldehyde, acrolein, aldehydes, alkylene oxides, amides, antimony, boron, boron halides, bromine chloric acid, chlorine monoxide, o-chlorontrobenzene, 1-chloro-2,4-nitrobenzene, chlorosilane, chloromelamine, chromium trioxide, chromyl chloride, epichlorohydrin, hexachloromelamine, hypochlorites (do NOT mix ammonia with liquid household bleach), isocyanates, nitrogen tetraoxide, nitrogen trichloride, nitryl chloride, organic anhydrides, phosphorous trioxide, potassium ferricyanide, potassium mercuric cyanide, silver chloride, stibine, tellurium halides, tellurium hydropentachloride, tetramethylammonium amide, trimethylammonium amide, trioxygen difluoride, vinyl acetate. Shock-, temperature-, and pressure sensitive compounds (azides, chlorides, nitrates, oxides). Vapours or solutions of ammonia are corrosive to copper, copper alloys, galvanised metal and aluminium. Mixtures of ammonia and air lying within the explosive limits can occur above aqueous solutions of varying strengths. Avoid contact with sodium hydroxide, iron and cadmium. Several incidents involving sudden "boiling" (occasionally violent) of a concentrated solution (d, 0.880, 35 wt %.) have occurred when screw-capped winchesters are opened. These are attributable to supersaturation of the solution with gas caused by increases in temperature subsequent to preparation and bottling. Avoid strong acids, acid chlorides, acid anhydrides and chloroformates. Avoid strong acids, acid chlorides, acid anhydrides and chloroformates. Avoid contact with copper, aluminium and their alloys.

SECTION 8 Exposure controls / personal protection

-

Control parameters

Occupational Exposure Limits (OEL)

INGR	EDIE	п ти	ATAC
INGIN			

Source	Ingredient	Material n	ame TWA		STEL P		ak	Notes	
Australia Exposure Standards	ammonia anhydrous liquefied	Ammonia 25 ppm / 17 mg/r		g/m3	24 mg/m3 / 35 ppm Not		t Available	Not Available	
Emergency Limits									
Ingredient	Material name TEEL-1		1		TEEL-2		TEEL-3		
ammonium hydroxide	Ammonium hydroxide	Ammonium hydroxide 61 ppm			330 ppm		2,300 ppm		
ammonia anhydrous liquefied	Ammonia	Not Available			Not Available		Not Available		
Ingredient	Original IDLH			Revised IDLH					
ammonium hydroxide	Not Available			Not A	lot Available				
ammonia anhydrous liquefied	300 ppm			Not A	Not Available				
Occupational Exposure Banding									
Ingredient	Occupational Exposure Band Rating			Occupational Exposure Band Limit					
ammonium hydroxide	E			≤ 0.1 ppm					
Notes:	Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the								

adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

Exposure controls

•	
Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure. Local exhaust ventilation usually required. CARE: Explosive vapour air mixtures may be present on opening vessels which have contained liquid ammonia. Fatalities have occurred
Personal protection	
Eye and face protection	 Chemical goggles. Full face shield may be required for supplementary but never for primary protection of eyes. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly.
Skin protection	See Hand protection below

Hands/feet protection	 Wear chemical protective gloves, e.g. PVC. Wear safety footwear or safety gumboots, e.g. Rubber When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots. The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	 Overalls. PVC Apron. PVC protective suit may be required if exposure severe. Eyewash unit. Ensure there is ready access to a safety shower.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

Respiratory protection

Type K Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

"Forsberg Clothing Performance Index". Where the concentration of gas/particulates in the breathing zone, approaches or The effect(s) of the following substance(s) are taken into account in the computerexceeds the "Exposure Standard" (or ES), respiratory protection is required. Degree of protection varies with both face-piece and Class of filter; the nature of

generated selection: Ammonia Solution 25% w/w

Material	CPI
BUTYL	С
BUTYL/NEOPRENE	С
CPE	С
HYPALON	С
NATURAL RUBBER	С
NATURAL+NEOPRENE	С
NEOPRENE	С
NEOPRENE/NATURAL	С
NITRILE	С
NITRILE+PVC	С
PVC	С
SARANEX-23	С
VITON/NEOPRENE	С

* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation.

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties Clear colourless liquid with ammonia odour; mixes with water. Appearance Physical state Liquid Relative density (Water = 1) 0.9 approx. Partition coefficient n-octanol Odour Not Available Not Available / water Odour threshold Not Available Auto-ignition temperature (°C) 651 pH (as supplied) Not Applicable Decomposition temperature Not Available Melting point / freezing point -72 Viscosity (cSt) Not Available (°C) Initial boiling point and boiling 36 Molecular weight (g/mol) Not Applicable range (°C) Flash point (°C) Not Applicable Taste Not Available Evaporation rate Not Available Explosive properties Not Available Flammability Not Applicable **Oxidising properties** Not Available Surface Tension (dyn/cm or Upper Explosive Limit (%) 25 Not Available mN/m) Lower Explosive Limit (%) 16 Volatile Component (%vol) Not Available

protection varies with Type of filter. Full-Face **Required Minimum** Half-Face Powered Air Protection Factor Respirator Respirator Respirator K-PAPR-AUS / K-AUS / Class 1 up to 5 x ES Class 1 K-PAPR-2 up to 25 x ES Air-line' K-2

K-3

Air-line**

50+ x ES ^ - Full-face

up to 50 x ES

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

Vapour pressure (kPa)	15 @ 20C	Gas group	Not Available
Solubility in water	Miscible	pH as a solution (1%)	13.8 (30% sol.)
Vapour density (Air = 1)	0.6	VOC g/L	Not Available

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	 Unstable in the presence of incompatible materials. Product is considered stable. Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	 Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects. The highly irritant properties of ammonia vapour result as the gas dissolves in mucous fluids and forms irritant, even corrosive solutions. Inhalation of the ammonia fumes causes coughing, vomiting, reddening of lips, mouth, nose, throat and conjunctiva while higher concentrations can cause temporary blindness, restlessness, tightness in the chest, pulmonary oedema (lung damage), weak pulse and cyanosis. Inhalation of high concentrations of vapour may cause breathing difficulty, tightness in chest, pulmonary oedema and lung damage. Brief exposure to high concentrations > 5000 ppm may cause death due to asphyxiation (suffocation) or fluid in the lungs. Prolonged or regular minor exposure to the vapour may cause persistent irritation of the eyes, nose and upper respiratory tract. Massive ammonia exposures may produce chronic airway hyperactivity and asthma with associated pulmonary function changes. The average nasal retention of ammonia by human subjects was found to be 83%. Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas. The vapour may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure. Inhalation of the vapour is hazardous and may even be fatal If exposure to highly concentrated vapour atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and unless resuscitated - death. 			
Ingestion	The material can produce chemical burns within the oral cavity and gastr Large doses of ammonia or injected ammonium salts may produce diarrh of urine and systemic poisoning. Symptoms include weakening of facial r Ingestion of alkaline corrosives may produce burns around the mouth, ul production, with an inability to speak or swallow. Both the oesophagus ar follow. Accidental ingestion of the material may be harmful; animal experiments produce serious damage to the health of the individual.	ointestinal tract following ingestion. noea and may be sufficiently absorbed to produce increased production muscle, tremor, anxiety, reduced muscle and limb control. cerations and swellings of the mucous membranes, profuse saliva nd stomach may experience burning pain; vomiting and diarrhoea may indicate that ingestion of less than 150 gram may be fatal or may		
Skin Contact	The material can produce chemical burns following direct contact with the skin. There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons. Mild skin reaction is seen with contact of the vapour of this material on moist skin. High concentrations or direct contact with solutions produces severe pain, a stinging sensation, burns and blisters and possible brown stains. Death could result from extensive burning. Vapour exposure may rarely, produce an itchy rash. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. Skin contact with alkaline corrosives may produce severe pain and burns; brownish stains may develop. The corroded area may be soft, gelatinous and necrotic; tissue destruction may be deep.			
Eye	The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating. If applied to the eyes, this material causes severe eye damage. The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. Direct eye contact with corrosive bases can cause pain and burns. There may be swelling, epithelium destruction, clouding of the cornea and inflammation of the iris. Mild cases often resolve; severe cases can be prolonged with complications such as persistent swelling, scarring, permanent cloudiness, bulging of the eye, cataracts, eyelids glued to the eyeball and blindness.			
Chronic	Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Prolonged or repeated minor exposure to ammonia gas/vapour may cause long-term irritation to the eyes, nose and upper airway. Repeated exposure or prolonged contact may produce skin inflammation and conjunctivitis. Other effects may include ulcers in the mouth and disturbances to the bronchi and gastrointestinal tract. In animals, repeated exposure to sublethal levels produces adverse effects on the airways, liver, kidneys and spleen, as well as eye irritation and clouding of the cornea.			
	τοχιστχ			
Ammonia Solution 25% w/w	Not Available	Not Available		
	ΤΟΧΙΟΙΤΥ	IRRITATION		
ammonium hydroxide	Inhalation(Rat) LC50 2.868 mg/L4hrs ^[2]	Eye (rabbit): 0.25 mg SEVERE		
	Oral(Rat) LD50 =350 mg/kg ^[2]	Eye (rabbit): 1 mg/30s SEVERE		
Ammonia Solution 25% w/w

	тохісіту	IRRITATION
ammonia anhydrous liquefied	Inhalation(Rabbit) LC50 =4.55 ppm4hrs ^[2]	Not Available
	Oral(Rat) LD50 =350 mg/kg ^[2]	
Legend:	 Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances 	

AMMONIUM HYDROXIDE	The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.		
AMMONIA ANHYDROUS LIQUEFIED	No significant acute toxicological data identified in literature search.		
AMMONIUM HYDROXIDE & AMMONIA ANHYDROUS LIQUEFIED	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritant. Concentration is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.		
Acute Toxicity	×	Carcinogenicity	X
Skin Irritation/Corrosion	×	Reproductivity	×
Serious Eye Damage/Irritation	×	STOT - Single Exposure	×
Respiratory or Skin sensitisation	×	STOT - Repeated Exposure	×
Mutagenicity	×	Aspiration Hazard	×
		Legend: 🗙 – Data either not	available or does not fill the criteria for classification

Legend

Data available to make classification

SECTION 12 Ecological information

Toxicity Endpoint Test Duration (hr) Species Value Source Ammonia Solution 25% w/w Not Not Not Not Available Not Available Available Available Available Endpoint Test Duration (hr) Species Value Source LC50 96 Fish 37mg/L 4 ammonium hydroxide 72 Fish 3.5mg/L 4 NOEC Endpoint Test Duration (hr) Species Value Source Fish 0.068mg/L LC50 96 2 ammonia anhydrous liquefied EC50 48 Crustacea >131mg/L 4 NOEL 384 Not Available 0.0000006-mg/L 4 Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

Very toxic to aquatic organisms.

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

For Ammonia:

Atmospheric Fate: Ammonia reacts rapidly with available acids (mainly sulfuric, nitric, and sometimes hydrochloric acid) to form the corresponding salts. Ammonia is persistent in the air.

Aquatic Fate: Biodegrades rapidly to nitrate, producing a high oxygen demand. Non-persistent in water (half-life 2 days).

Ecotoxicity: Moderately toxic to fish under normal temperature and pH conditions and harmful to aquatic life at low concentrations. Does not concentrate in food chain.

Prevent, by any means available, spillage from entering drains or water courses.

DO NOT discharge into sewer or waterways

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
ammonia anhydrous liquefied	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
ammonia anhydrous liquefied	LOW (LogKOW = 0.229)

Ammonia Solution 25% w/w

Ingredient	Mobility
ammonia anhydrous liquefied	LOW (KOC = 14.3)

SECTION 13 Disposal considerations

Waste treatment methods	
Product / Packaging disposal	 Containers may still present a chemical hazard/ danger when empty. Return to supplier for reuse/ recycling if possible. Otherwise: If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill. Where possible retain label warnings and SDS and observe all notices pertaining to the product. Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate: Reduction Reuse Recycling Disposal (if all else fails) This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. Do NOT allow wash water from cleaning or process equipment to enter drains. It may be necessary to collect all wash water for treatment before disposal. In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. Where in doubt contact the responsible authority. Recycle wherever possible. Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with suitabl

SECTION 14 Transport information

Labels Required Image: Constraint of the second s

Land transport (ADG)

UN number	2672		
UN proper shipping name	AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia (contains ammonium hydroxide)		
Transport hazard class(es)	Class 8 Subrisk Not Applicable		
Packing group	III		
Environmental hazard	Environmentally hazardous		
Special precautions for user	Special provisions Not Applicable Limited quantity 5 L		

Air transport (ICAO-IATA / DGR)

	,	
UN number	2672	
UN proper shipping name	Ammonia solution relativ ammonia (contains amm	e density (specific gravity) between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% nonium hydroxide)
Transport hazard class(es)	ICAO/IATA Class ICAO / IATA Subrisk ERG Code	8 Not Applicable 8L
Packing group	Ш	

	Environmental hazard	Environmentally hazardous		
		Special provisions	A64 A803	
		Cargo Only Packing Instructions	856	
		Cargo Only Maximum Qty / Pack	60 L	
	Special precautions for user	Passenger and Cargo Packing Instructions	852	
		Passenger and Cargo Maximum Qty / Pack	5 L	
		Passenger and Cargo Limited Quantity Packing Instructions	Y841	
		Passenger and Cargo Limited Maximum Qty / Pack	1 L	

Sea transport (IMDG-Code / GGVSee)

UN number	2672		
UN proper shipping name	AMMONIA SOLUTION (contains ammonium h	AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15ŰC in water, with more than 10% but not more than 35% ammonia (contains ammonium hydroxide)	
Transport hazard class(es)	IMDG Class 8 IMDG Subrisk N	ot Applicable	
Packing group	Ш		
Environmental hazard	Marine Pollutant		
Special precautions for user	EMS Number Special provisions Limited Quantities	F-A , S-B Not Applicable 5 L	

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

ammonium hydroxide is found on the following regulatory lists

Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6 Australian Inventory of Industrial Chemicals (AIIC)

ammonia anhydrous liquefied is found on the following regulatory lists

Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5 Australian Inventory of Industrial Chemicals (AIIC)

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (ammonium hydroxide; ammonia anhydrous liquefied)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

SECTION 16 Other information

Revision Date	01/11/2019
Initial Date	12/10/2009

SDS Version Summary

Version	Issue Date	Sections Updated
3.1.1.1	01/11/2019	One-off system update. NOTE: This may or may not change the GHS classification

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC – TWA: Permissible Concentration-Time Weighted Average PC – STEL: Permissible Concentration-Short Term Exposure Limit IARC: International Agency for Research on Cancer ACGIH: American Conference of Governmental Industrial Hygienists STEL: Short Term Exposure Limit TEEL: Temporary Emergency Exposure Limit_e IDLH: Immediately Dangerous to Life or Health Concentrations OSF: Odour Safety Factor NOAEL :No Observed Adverse Effect Level LOAEL: Lowest Observed Adverse Effect Level LOAEL: Lowest Observed Adverse Effect Level TLV: Threshold Limit Value LOD: Limit Of Detection OTV: Odour Threshold Value BCF: BioConcentration Factors BEI: Biological Exposure Index

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SAFETY DATA SHEET

According to Work Health and Safety Regulations 2011 and National Model Code of Practice for the

preparation of Safety Data Sheets for Hazardous Chemicals

Version 1.1 Issue date: 18/09/2019 Revision date: 23/05/2022

SDS Record Number: CSSS-TCO-010-129339

1. Identification of the material and supplier					
Material name:	SINOPEC Aqueous Urea Solution AUS 32				
Other Names:	-				
Recommended use:	Applied to trucks and buses equipped with the SCR, to reduce the content of nitrogen				
	oxides in the exhaust gas.				
Manufacturer:					
Supplier(Manufacturer):	SINOPEC LUBRICANT CO.,LTD				
Address:	No. 6 Anning Zhuang West Road, Haidian District, Beijing, P.R.China				
Contact person(E-mail):	csc.lube@sinopec.com				
Telephone:	86-800-810-9886				
Fax:	86-10-82410856				
Emergency number:	86-800-810-9886				
Australia Supplier(Manufacturer):	International Lubricant Distributors Pty. Ltd.				
Address:	21 Logistics Boulevard, Kenwick, WA 6107, Australia				
Contact person(E-mail):	-				
Telephone:	-				
Fax:	+61 8 9381 1788				
Emergency number:	1300 558 939				
New Zealand Supplier(Manufacturer):	MTS ENERGY LTD				
Address:	PO BOX 302-133 North Harbour, Auckland 0751, New Zealand				
Telephone:	+64 9 480 8921				
Fax:	+64 9 480 8398				
Emergency number:	0800 399 993 (24 Hrs)				

2. Hazards identification

GHS classification:	
Physical hazards:	Not classified
Health hazards:	Not classified
Environmental hazards:	Not classified
GHS label elements:	
Hazard Pictograms: :	No hazard pictogram is used.
Signal word:	No signal word is used.
Hazard statement:	Not applicable.
Precautionary statement:	
Prevention:	Not applicable.
Response:	Not applicable.
Storage:	Not applicable.
Disposal:	Not applicable.
Specific hazards:	Not applicable.

3. Composition/information on ingredients					
Components	CAS No.	Percent			
Urea	57-13-6	31.8~33.2%			
Water 7732-18-5 66.8~68.2%					

4. First aid measures					
Inhalation:	Move exposed person to fresh air and provide oxygen. Get medical attention if				
	coughing or respiratory discomfort occurs.				
Skin:	As a precaution, remove clothing and shoes if contaminated. Avoid prolonged or				
	repeated contact with skin. Wash with soap and water to remove the material from				
	skin. Get medical attention.				
Eye:	Wash eyes with water for 15 minutes. If irritation occurs, get medical attention.				
Ingestion:	If large quantities of this material are swallowed, call a physician immediately. Do not				
	induce vomiting unless directed to do so by medical personnel. Never give anything by				
	mouth to an unconscious person.				
Notes to physician:	Treat symptomatically.				
5. Fire-fighting measures					
Suitable extinguishing media:	Products contain large amounts of water, so there is no limit to the types of fire				
	extinguishing medium, the choice of its surrounding area environment should be				
	considered. Spray, Carbon dioxide, foam, dry chemical and water fog.				
Extinguishing media which must not be	Not available				
used for safety reasons:					
Specific hazards arising from the	Incombustible, fire could cause the release of harmful vapors. When fire may produce				
chemical:	carbon monoxide, nitrogen dioxide, nitrogen oxide and other organic matter such as				
	cracking of typical combustible components.				

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

 HAZCHEM code
 None.

6. Accidental release measures						
Personal precautions:	Cut off the source of fire, immediately contact the workers, and keep other person stay					
	in safe areas. As much as possible cut off the source of leakage, prevent it access to					
	sewers, drains, water. Comply with relevant fire procedures, and refer to chapter 8 of					
	the safety data sheet.					
Containment procedures:	Do not let product enter drains.					
Methods for cleaning up:	FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.					
	FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other					
	suitable material. Place in non-leaking container and seal tightly for proper disposal.					

7. Handling and storage

Precautions for safe handling:

Avoid long or repeated contact with skin, thoroughly clean after contact. Prevent damage of packaging and container, loading and unloading lightly when moving, Operators must receive special training; strictly abide by the operation procedures. To avoid oxidizing reaction. Avoid contact with the strong acid, hydrochloric acid, acid anhydride and chloroformate. Equipped with corresponding quantity of fire equipment and emergency handling equipment. When loading and unloading of 200 liters of bottled products, should wear protective shoes. Empty containers may remain inside.

Storage:

Keep container sealed, do not store in open or unlabeled containers. Store in a cool, dry place with adequate ventilation, keep away from strong oxidizer, sunlight, heat and combustible. Storage temperature is -5° C -25° C. Store in original container.

8. Exposure controls/personal protection

Control parameters	Follow standard monitoring procedures.			
Occupational exposure limits	No exposure limits noted for ingredient(s).			
Biological limit values:	No biological exposure limits noted for the ingredient(s).			
Exposure guidelines	No exposure standards allocated.			
Appropriate engineering controls: Use process enclosures, local exhaust ventilation or other engineerin				
	worker exposure to airborne contaminants below any recommended or statutory limits.			
Personal protective equipment:				
Eye/face protection:	If may splash, use safety goggles please.			
Skin protection:	Under the condition of normal use, in addition to ordinary work clothes, do not need			
	special skin and body protection equipment. In case of splash, according to the actual			
	situation of the workplace to choose suitable, non-permeable safety clothing and safety			
	shoes, recommended material is NBR.			
Respiratory protection:	Don't need to wear respiratory protective equipment under the condition of normal use.			
	If engineering controls do not maintain airborne concentrations to a level which is			
	adequate to protect worker health, need to choose to conform to the requirements of			
	the relevant laws and regulations of respiratory protection equipment. Specific content			
	consult the supplier of respiratory protection equipment.			
Hand protection:	Using the resistance to chemical corrosion protective gloves, such as the use of PVC			
	material gloves. Contaminated gloves timely replacement. Thoroughly clean with soap			
	and water after operation.			

9. Physical and chemical properties

Appearance:			
Physical state:	Liquid		
Form:	Liquid		
Color:	Colorless transparent		
Odor:	Slight ammoniacal.		
Odour threshold:	Not available		
PH:	9~11		
Melting point/Freezing point:	-11.5 °C		
Initial boiling point and boiling range:	100°C		
Flash point:	Not available		
Evaporation rate:	Not available		
Flammability (solid, gas) :	Not available		
Upper/lower flammability or explosive	Not available		
limits:			
Vapor pressure:	6.4kPa @ 40°C		
Vapor density(Air = 1):	Not available		
Material name: SINOPEC Aqueous Urea Solution A	US 32 vision date: 23-05-2022		

Density:	1087.0~1093.0kg/ m3 @ 20°C
Solubility (H ₂ O) :	Soluble in water
Solubility (Other) :	Not available
Partition coefficient (n-octanol/water) :	<1
Auto-ignition temperature:	Not available
Decomposition temperature:	100°C
Viscosity:	Not available
Organic solvents:	Not available
Water:	Not available
VOC (EC) :	Not available
Solids contents:	Not available
Molecular Formula:	Not available
Molecular Weight:	Not available
Pour Point:	Not available

10. Stability and reactivity

Reactivity:	The substance is stable under normal storage and handling conditions.			
Chemical stability:	Stable at room temperature in closed containers under normal storage and handling			
	conditions.			
Possibility of hazardous reactions:	No dangerous reactions known.			
Conditions to avoid:	Extreme heat and high energy sources of ignition and strong oxidants.			
Incompatible materials:	Strong oxidants.			
Hazardous decomposition products:	Carbon monoxide, nitrogen dioxide, nitrogen oxide and other organic matter such as			
	cracking of typical combustible components.			

11. Toxicological information

Toxicological data:	
Acute toxicity:	
LD50(Oral, Rat):	Not available
LD50(Dermal, Rat):	Not available
LC50(Inhalation, Rat):	Not available
Skin corrosion/Irritation:	No data available.
Serious eye damage/irritation:	No data available.
Respiratory or skin sensitization:	No data available.
Germ cell mutagenicity:	No data available.
Carcinogenicity:	No data available.
Reproductive toxicity:	No data available.
STOT- single exposure:	No data available.
STOT-repeated exposure:	No data available.
Aspiration hazard:	No data available.
Other information	This product has no known adverse effect on human health.

12. Ecological information

Toxicity:

Acute t	oxicity	Time	Species	Method	Evaluation	Remarks
LC50	N/A	96h	Fish	OECD 203	N/A	N/A
EC50	N/A	48h	Daphnia	OECD 202	N/A	N/A
EC50	N/A	72h	Algae	OECD 201	N/A	N/A

Persistence and degradability:

Expected easily biodegradable.

Bioaccumulative potential:	Low potential for bio-accumulation.
Mobility in soil:	Weaker soil adsorption.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations			
Disposal methods:	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.		
Waste from residues/unused products:	Dispose of in accordance with local regulations. Empty containers or liners may retain		
	some product residues. This material and its container must be disposed of in a safe		
	manner (see: Disposal instructions).		
Contaminated packaging:	Empty containers should be taken to an approved waste handling site for recycling or		
	disposal. Since emptied containers may retain product residue, follow label warnings		
	even after container is emptied.		

14. Transport information

ADG	
UN number	Not regulated
Proper shipping name	Not regulated
Hazard class	Not regulated
Packing group	Not regulated
Labels required	Not regulated
Special precautions	Read safety instructions, SDS and emergency procedures before handling.
ΙΑΤΑ	
UN number	Not regulated
Proper shipping name	Not regulated
Hazard class	Not regulated
Packing group	Not regulated
Special precautions	Read safety instructions, SDS and emergency procedures before handling.
IMDG	
UN number	Not regulated
Proper shipping name	Not regulated
Hazard class	Not regulated
Packing group	Not regulated
Environmental hazards	
Marine pollutant	No
Special precautions	Read safety instructions, SDS and emergency procedures before handling.
Transport in bulk according to Annex II	Not regulated
of MARPOL 73/78 and the IBC Code:	

15. Regulatory information

Safety, health and environmental regulations

National regulations

Australia Medicines & Poisons Appendix A/D/E/F/G/H/I/J/K / Australia Medicines & Poisons Schedule 2/3/4/5/6/7/8/9/10 Poisons schedule number not allocated.

Australia Medicines & Poisons Appendix B

Urea (CAS 57-13-6)

Urea (CAS 57-13-6)

High Volume Industrial Chemicals (HVIC)

100000 - 999999 TONNES See the regulation for additional information.

Water (CAS 7732-18-5)

1000 - 9999 TONNES See the regulation for additional information.

Importation of Ozone Deleting Substan	ces (Customs(Prohibited imports) Regulations 1956, Schedule 10)	
Not listed.		
National Pollutant Inventory (NPI) subs	tance reporting list	
Not listed.		
Prohibited Carcinogenic Substances		
Not regulated.		
Prohibited Substances (National Mode	el Regulation for the control of Workplace Hazardous Substance	es, Schedule 2
NOHSC:1005 (1994) as amended)		
Not listed.		
Resricted Importation of Organochlorin	e Chemicals (Customs(Prohibited Imports) Regulations 1956, Sche	dule 9)
Not listed.		
Restricted Carcinogenic Substances		
Not regulated.		
International regulations		
Stockholm Convention		
Not applicable		
Rotterdam Convention		
Not applicable.		
Kyoto protocol		
Not applicable.		
Montreal Protocol		
Not applicable.		
Basel Convention		
Not applicable.		
Inventory status:		
Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic /Non-Domestic Substances List (DSL) /(NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial/ Notified Chemical	Yes
	Substances (EINECS) / (ELINCS)	
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes
*A "Yes" indicates this product complies with	the inventory requirements administered by the governing country(s)	

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information	
Indication of changes:	Version 1.1
Training instructions:	Not applicable.
Further information:	This information is based upon the present state of our knowledge. This SDS has been
	compiled and is solely intended for this product.
Notice to reader:	Employers should use this information only as a supplement to other information
	gathered by them, and should make independent judgment of suitability of this
	information to ensure proper use and protect the health and safety of employees.
	This information is furnished without warranty, and any use of the product not in

conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Appendix B Site layout -ST0042



10	11	12	_					
	LEGEND							
	TOC1B							
A - 1 Drving, 2 - G	asification							
B - Heat integratio	n							
C - 1 - Outloading	bins, 2 - Emergency bin	. 3 - Bag house	A					
D - Chemicals bun	D - Chemicals bund and unloading bay							
F - Drver gas scru	bbers							
F - 1 Drver/Gasific	ation I V Swithroom 2 -	RDT Switchroom						
G - I PG Storage								
H - Nitrogen								
I - RDT Building								
I - HV Switchroom	1							
K - Sludge Mixing	Tank							
L - Stormwater firs	t flush		В					
M - Grit vortex								
P - Centrate num	station							
7 Euture (Elltimat								

NORTH Riv	IWEST H 'ERSTO SITE LA	drawing no. ST0042 C-SKT-9008-1				
					SHEET No.	
0.	DRAWING	STATUS: FOR REVIEW				
10		11			12	-

Appendix C Sydney Water risk matrix

Risk Matrix

	Public health	Injury/Illness	Reputation	Environment	Compliance	Financial loss	Customer & Community	Performance	Rare	Very Unlikely	Unlikely	Possible	Likely	Very Likely
	Exposure to unsafe product (acute, contaminant, chronic contaminant or hazardous material)	Harm to health and wellbeing (including psychological harm) of employees, contactors, members of public	Impact to our brand and/or reputation in terms of stakeholders, customers and trust	Adverse effect on flora, fauna, soil, waterways, resources, air quality Harm to natural and/or cultural heritage (including Aboriginal objects and Aboriginal places	Breach of legal or regulatory compliance	Financial losses or unrecoverable expenditure is incurred	Disruption to and/or cost associated with loss or damage to customer, community & developers	Impact on achieving strategic initiative Project performance impacts achieving program benefits and delivery	A very distant chance of occurring under exceptional circumstances < 0.004 < 1 in 250 < 0.4%	Not expected to occur 0.004 to 0.02 1 in (250 to 50) 0.4% to 2%	More likely to not occur, surprised if it happens 0.02 to 0.1 1 in (50 to 10) 2% to 10%	Might occur in some circumstances 0.1 to 0.5 1 in (10 to 2) 10% to 50%	Will occur in most circumstances 0.5 to 2.5 1 in (2 to 0.4) 50% to 90%	Expected to occur frequently > 2.5 > 1 in 0.4 > 90%
Extreme	 Exposure of whole drinking water supply delivery system or high exposure recycled water schemes to an Acute Hazard. 	Multiple Fatalities.	 Government enquiry or extended, negative, continuous national/international media coverage >1 week. Loss of customer trust. 	 Irreversible harm to a high value/significant or highly sensitive receiving environment. Irreversible wilful harm to state/nationally/world listed heritage or wilful desecration to registered Aboriginal cultural heritage. 	 Loss of operating licence. High impact prosecution due to wilful act. 	• >\$250m	 >\$125m in customer or community loss/damage Loss of service/product reliability of >200,000 customer days 	 Majority of corporate/enterprise objectives/benefits not achieved. Majority of project objectives not achieved which are essential for program outcomes. Level 1 & 2 Projects: \$250M cost change or schedule change of >12 months. Level 3 & 4 Projects: > \$25M cost change or schedule change of >12 months. 	Medium	High	High	Very High	Very High	Very High
Critical	 For a drinking water supply system or a recycled water scheme: Exposure of large numbers of people (>10,000 but not meeting Extreme criterion) to an Acute Hazard, or For biosolids or recreational water: Exposure of >10,000 people annually to an Acute Hazard. 	Single Fatality.	 Ministerial intervention or extended, negative, continuous national/Sydney metro and social media coverage >3 days. Decrease in customer trust. 	 Long term event, requires extensive environmental remediation effort for 1 month or more. Significant biodiversity damage (acute or long term) to a high value/significant or highly sensitive receiving environment. Negligent harm to state/nationally/world listed heritage or desecration to registered Aboriginal cultural heritage. 	 Government intervention. High-profile prosecution due to negligence. 	• \$50m to \$250m	 \$25m to \$125m in customer or community loss/damage Loss of service/product reliability of 40,000 to 200,000 customer days 	 Multiple corporate/enterprise objectives/benefits not achieved. Multiple project objectives not achieved which are essential for program outcomes. Level 1 & 2 Projects: \$50M - \$250M cost change or schedule change of 6 to 12 months. Level 3 & 4 Projects: \$5M - \$25M cost change or schedule change 6 to 12 months. 	Medium	Medium	High	High	Very High	Very High
Major	 For a drinking water supply system or recycled water scheme: Exposure of <10,000 people to an Acute Hazard, or >10,000 people or whole of supply system repeatedly exposed to Chronic Hazard, or For biosolids or recreational water: Exposure of <10,000 people annually to an Acute Hazard. 	 Permanent total disability/loss of capacity. 	 Ministerial interest or unbalanced, primarily Sydney metro and social media coverage >24 hours. Widespread complaints or multiple escalated complaints to Minister or ombudsman. 	 Medium term reversible pollution, requires substantial environmental remediation (multiple weeks). Major biodiversity damage, harm to a high value/significant or sensitive receiving environment. Major adverse impact to state and local-listed heritage or significant harm to registered Aboriginal cultural heritage. 	 Regulatory sanction (Multiple statutory fines, Enforceable Undertaking). Low level prosecution. 	• \$10m to \$50m	 \$5m to \$25m in customer or community loss/damage Loss of service/product reliability of 8,000 to 40,000 customer days 	 Majority of Group objectives/benefits not achieved. Majority of project objectives not achieved which are important for program outcomes. Level 1 & 2 Projects: \$10M - \$50M cost change or schedule change of 3 to 6 months. Level 3 & 4 Projects: \$1M - \$5M cost change or schedule change of 3 to 6 months. 	Low	Medium	Medium	High	High	Very High
Moderate	 For a drinking water supply system, recycled water scheme, recreational water or biosolids: Repeated exposure of <10,000 people to Chronic Hazard in a year. 	 Immediate admission to hospital as an inpatient and/or permanent partial disability/loss of capacity. 	 Local MP interest and/or local media and social media coverage >24 hours. Multiple and repeated customer complaints. 	 Short term reversible pollution, requires some environmental remediation (1 week). Harm to local high value/significant or sensitive environment. Damage to locally listed heritage or partial harm to registered Aboriginal cultural heritage. 	 Ministerial requirement due to Operating Licence non-compliance. Regulatory sanction (statutory fine, Penalty Infringement Notice). 	• \$2m to \$10m	 \$1m to \$5m in customer or community loss/damage Loss of service/product reliability of 1,600 to 8,000 customer days 	 Majority of business objectives/benefits not achieved. Multiple project objectives not achieved which are important for program outcomes. Level 1 & 2 Projects: \$2M - \$10M cost change or schedule change of 1 to 3 months. Level 3 & 4 Projects: \$200K - \$1M cost change or schedule change of 1 to 3 months. 	Low	Low	Medium	Medium	High	High
Minor	 Isolated sample(s) above Chronic Hazard guideline values. No trend. 	 Treatment by a registered medical practitioner requiring ongoing treatment with no permanent disability/loss of capacity. 	 Balanced coverage (i.e. includes Sydney Water's position) <24 hours. Some customer complaints. 	 Temporary pollution, requires some environmental remediation (days). Localised harm to a natural environment, impact minimal to overall biodiversity value and plant and/or animals. Minor adverse impact to heritage values or unregistered Aboriginal objects. 	Minor corrective action or additional business requirement imposed.	• \$400,000 to \$2m	 \$200,000 to \$1m in customer or community loss/damage Loss of service/product reliability of 320 to 1,600 customer days 	 Minority of business objectives/benefits not achieved. Minority of project objectives not achieved which are desirable for program outcomes. Level 1 & 2 Projects: \$400k - \$2M cost change or schedule change of 2 weeks to 1 month. Level 3 & 4 Projects: \$40k - \$200k cost change or schedule change of 2 weeks to 1 month. 	Low	Low	Low	Medium	Medium	High
Minimal	 Sample(s) above operational target(s). No trend. 	 Recoverable injury or illness requiring first aid or medical treatment with no follow up required. 	 One-off informative media coverage. Some customer contacts. 	 Temporary pollution contained with controls. Insignificant, naturally reversible biodiversity damage. Trivial/negligible impact to potential heritage value or unregistered Aboriginal objects. 	 Technical compliance issue or breach with no material impact. 	• <\$400,000	 <\$200,000 in customer or community loss/damage Loss of service/product reliability of <320 customer days 	 Very few/limited business objectives/benefits not achieved. Very few/limited project objectives not achieved which are desirable for program outcomes. Level 1 & 2 Projects: < \$400k cost change or schedule change of < 2 weeks. Level 3 & 4 Projects: < \$40k cost change or schedule change of < 2 weeks. 	Low	Low	Low	Low	Medium	Medium

Sydney WATER

Risk management process



Control effectiveness rating (analyse the risks)

Control effectiveness describes how well a control or set of controls are reducing or managing the relevant risk they are associated with.

A control or set of controls increase in effectiveness when they are designed to address the relevant risk, addresses most/all the risk, operates as expected and at the right time. The rating should consider the implementation, assurance activities conducted and the availability of records of such activities.

Control Effectiveness Rating	Description
Effective	The controls are well documented, consistently applied and reliable in addressing the source of the risk. Management has a high degree of confidence in the protection provided by the controls in eliminating or removing the root cause of the risk.
Partially effective	The controls are in place but may be partially documented or communicated or are inconsistently applied or tested. Minor/moderate opportunities for improvement to the controls have been identified (not serious deficiencies in systems or practices).
Ineffective	The controls are not documented or communicated or are inconsistently implemented. The controls are not designed or operating as intended meaning the root cause of the risk isn't being managed.

Portfolio, program and project prioritisation overlay

The following overlay can be used to aid prioritisation of portfolio, program, and project risks for action to minimise impacts on project objectives.

	Rare	Very Unlikely	Unlikely	Possible	Likely	Very Likely
Extreme	4	3	2	1	1	1
Critical	5	4	3	2	1	1
Major	6	5	4	3	2	1
Moderate	6	6	5	4	3	2
Minor	6	6	6	5	4	3
Minimal	6	6	6	6	5	4

Response and escalation table

Current Risk				Escalation for d			
	Risk Rating	Respo	nse to risk rating	Portfolio, Program and Project related risks	Other risks	Decision	
	Very High	Highly Undesirable	Activity that could trigger the risk must not start or continue until treatment options are explored to: • Choose to do something different • Improve control effectiveness • Change likelihood • Change consequence Treat risk as soon as possible	Executive Sponsor	Managing Director	Endorse treatment plan for risks out of appetite (time and resources for implementation) OR Accept risk if within appetite where the cost of risk treatment outweighs the benefits and ensure risk is monitored.	
	High	Undesirable	Activity that could trigger the risk must not start or continue until treatment options are explored to: • Choose to do something different • Improve control effectiveness • Change likelihood • Change consequence Treat risk within 3 months	Project/Program Sponsor	General Manager	Endorse treatment plan for risks out of appetite (time and resources for implementation) OR Accept risk if within appetite where the cost of risk treatment outweighs the benefits and ensure risk is monitored.	
	Medium	Acceptable	If risk is not as low as reasonably practicable, explore treatment options to: • Choose to do something different • Improve control effectiveness • Change likelihood • Change consequence Treat risk within 3 to 6 months OR Monitor risk for systemic trend or change in context.	Project/Program Owner	Head of Business	Endorse treatment plan (time and resources for implementation) OR Accept the risk without further treatment but ensure risk is monitored.	
	Low	Desirable	Monitor risk for systemic trend or change in context. Risk Owner may still consider further treatment actions if they are cost effective and beneficial.	Project/Program Manager	Line Manager	Ensure risk is monitored.	

* Escalation of risks should follow reporting lines.

Examples of Consequences

	Public Health	Injury/IIIness	Reputation	Environment	Compliance	Financial Loss	Customer & Community	Performance
Extreme	 Acute hazards are pathogens and a defined list of chemicals. Acute/high impact chemicals: arsenic, cyanide, selenium, nitrate, uranium, copper, lead, methyl mercury, toluene, polychlorinated biphenols (PCBs). Whole of drinking water systems applies to the 13 delivery systems. High exposure recycled water schemes are those with the end use of dual reticulation or firefighting. Whole of drinking water system: 2014 – Flint, Michigan, USA Lead (Pb) contamination exposing over 100,000 residents. 1993 – Milwaukee, Wisconsin USA – Cryptosporidium outbreak with >500,000 exposed. 2000 – Walkerton, Ontario, Canada. Town's water supply polluted by cattle faeces. 	 Various mining accidents in Australia and New Zealand 	 1998 – Sydney, NSW Sydney Water Cryptosporidium Water Quality Crisis with ongoing international media coverage. Poor response from Sydney Water led to the creation of Water NSW. 	 Contamination of an aquifer Extermination of plants/animals from endangered or significant species or communities in a location Complete demolition and destruction of a landscape, building, structure, or Aboriginal cultural heritage 	 1997 – Karuah, NSW – EPA v Charles Anthony Leslie Gardner Wilful discharge of untreated sewage from Karuah Jetty Village into the wetlands on the south-western shore of the Karuah River. Defendant was: convicted sentenced to 12 months imprisonment ordered to pay \$250,000 penalty ordered to pay Prosecutor's cost of \$170,000 	 2018 – Sydney Light Rail Cost Blowout by \$500m (\$1.6bn to \$2.1bn) 2018 – BHP Pilbara Ore Train intentional derailment >\$300m 	 Loss of service for: Prospect (1.65m customers) for >3 hours Prospect North (329,000 customers) for >15 hours Illawarra (117,000 customers) for >1.7 days 2013 - Endeavour Energy power line caused the Blue Mountains bushfire - 159 homes destroyed, \$200m damages Disruption to major services for the entire Sydney CBD for 1 day, potentially @ \$369m All of Sydney boil water alert issued by NSW health for 30 days estimated to cost \$500m 	 Failure of customer- centric focus strategy measured by reduced brand scores
Critical	 Exposure to numbers >10,000 may apply to drinking water supply zones/ service reservoir zones, but less than whole of system. Recycled water schemes which supply for the end uses of municipal irrigation and fodder cropping. 	 2011 – Bangholme, VIC Melbourne Water worker drowned after falling into a sewage treatment channel. Melbourne Water pleaded guilty to failing to provide a safe workplace after investigations showed a grate covering had given way or was missing. 	 1980s – Bondi, Malabar, North Head, NSW "Poo Marches" against shoreline outfalls 2014 – Toledo, Ohio, USA Weekend exposure to algal toxin over chronic guideline value leading to extended national media coverage. 	 Extensive environmental damage with long term management requirements eg. contamination of water body or land, ongoing weed management program Irreversible impact on local population of threatened plants/animals or communities Major irreparable damage to a landscape, building or structure eg, loss of or damage to original stables in a Colonial farm complex 	 Systemic failure of assets leading to multiple failures. Tier 1 POEO Act offence 	 2002 – Sydney, NSW Sydney Water's Customer Information and Billing System (CIBS) expected to be operational by February 2002, at a cost of \$38.2 million. Sydney Water terminated the CIBS project in October 2002 after spending approximately \$61.0 million and another \$18.6 million on related CIBS hardware and software. Most of the \$61.0 million was written-off. 	 Loss of service for Prospect North (329,000 customers) for 3 to 15 hours Illawarra (117,000 customers) for 8 hours to 1.7 days North Richmond (19,000 customers) for 2 to 10 days Disruption to flights at Sydney Airport for 1 day @ \$40m/day 	 Fail to complete upgrade of treatment capacity upgrade in Riverstone affects success of North-west growth program outcomes
Major	 Re-chlorination of small drinking water reservoir is insufficient over time allowing growth of opportunistic pathogens. Total trihalomethanes (TTHMs) repeatedly exceed guideline value within a drinking water supply system. Thames River Swim outbreak: 2014 – ~1,000 people exposed. 		 2010 – ICAC Plumbing Inspector Bribing Investigation Cyanobacterial toxin release from Prospect WFP above chronic guidelines for days to weeks 	 Improper management or unauthorised disposal/ storage of waste materials impacting community/wildlife health Several plants/animals of significance/endangered die or habitat displacement, putting local population at risk or the value of the land Major but repairable adverse impact to a landscape, building or structure e.g cutting through a paved courtyard 	 Multiple overflows on retic sewers/from pumping stations and failure to clean up leading to Tier 2 POEO Act offence 	 Failure to carry out maintenance over a period of time. Cost of not doing the work could be the amount of an environmental benefit order, eg saving of \$20m but fine would be \$20m 	 Loss of service for North Richmond (19,000 customers) for 10 hours to 2 days) Helensburgh (3,000 customers) for 2.6 to 13 days) 	
Moderate	Subsection of a drinking water supply eg supply zone/reservoir supply zone, or small recycling scheme or part thereof repeatedly has Total trihalomethanes (TTHMs) exceedances.	 2015 – While clearing a choke blockage, a worker suffered serious facial injuries after a jetter hose that was being pulled from a manhole hit the worker in the face leading to admission to hospital. 	 2009 – Bellevue Hill, Sydney Water incorrectly identified leak location. Caused landslip and significant safety issues. Road closure for several days. Several days of media. 	 Improper management or unauthorised disposal/ storage of waste Localised land/air/water pollution in National Park. Plants/animals of significance/endangered impacted directly Adverse impact to landscape, building or structure e.g. destroying an original sandstone kerbing block 	Penalty notice		 Loss of service for North Richmond (19,000 customers) for 2 to 10 hours Helensburgh (3,000 customers) for 13 hours to 2.6 days Cowan North (500 customers) for 3.2 to 13 days Disruption to services at RNS/Westmead Hospital for 1 day @ \$4-5m/day Bellevue Hill landslip and road closures ~\$2.5m 	
Minor	 Aluminium, iron or Total trihalomethanes (TTHMs) exceed guideline in a drinking water delivery system on occasion. 	 2018 – a worker experienced a gradual onset of lower back pain reportedly due to prolonged periods of driving at work and poor vehicle ergonomics leading to ongoing treatment until full recovery. 	 Traffic media report on main break. No continued coverage. 2016 – Petersham burst trunk watermain (500mm), media for one day only. 	 Small spill into the environment or non- hazardous waste inappropriately recycled Small volume and localised wastewater overflow into creek Damaging original sandstone kerbing Damage to unregistered Aboriginal midden during excavation 	Clean-up notice		 Loss of service for Helensburgh (3,000 customers) for 2.5 to 13 hours Cowan North (500 customers) for 15 hours to 3.2 days Petersham burst trunk watermain (500mm) 2016, damage to property < \$0.5m 	
Minimal	 Sample result above operational target but within guidelines. May be early warning instigating process or data review, especially for data trends. 	 2017 – a worker had an allergic reaction to the carpet cleaning products used at Head Office. The worker has a history of asthma. 	 5000 double bills sent out to customer leading to customer contacts and an announcement by SWC posted on the website that only one of the bills needed to be paid. The story did not reach the media. 	 Immediate clean-up of leak without spilling onto soil or reaching a waterway Temporarily removing and then reinstating an original sandstone kerbing block Works stopped due to unexpected aboriginal object find 	Internal policy breach	Chemical supply price increase leading to an increase to OPEX	Cowan North (500 customers) for 0 to 15 hours	

Examples of Consequences for Portfolios, Programs and Projects

		Infrastructure		
	Digital	Complex Projects/Programs/Portfolios	BAU Projects/Programs	Business Improvement Progra
Extreme	 eBill Migration fails or is delayed leading to: Customers do not receive their bills and payments are not made High number of inbound calls to the Contact Centre and Billing and Revenue teams Delay to program delivery (schedule change >12 months) with associated cost of over-run (>\$10M) 	 Land acquisition - land planned for becomes unavailable leads to: Increased costs (>100M) for land acquisition, additional work required to find alternatives/resize assets 	 Untried methodology for this project could blow out timeline leading to failure to meet court ordered project deadlines (schedule change >12 months). 	
Critical	 Key Project people flight risks (contracts) leads to: Key specialists critical to the Program are suddenly not available and it may take some time to source a replacement Important aspects of the build and implementation may be at risk thus jeopardizing the planned Go Live date (schedule change 6 months - <12 months) 	 Future developments are approved (by DPE or council) without requirements for recycled water connections and/or regional stormwater harvesting scheme leading to sub-optimal scheme (benefits not fully realised). Unable to deliver viable IWCM scheme: anticipated avoidable costs (\$30M - \$100M) are not realised funding arrangement does not cover the full funding gap sets a precedence 	 Failure to meet project deadlines (schedule change 6 months - <12 months) due to further significant erosion of Boundary Creek Banks leads to: Further legal action and/or fines Temporary works only minimise risk of further erosion up to 0.5EY event A risk of further erosion for events greater than a 0.5EY event until the Substantial Works have been completed 	
Major	 Portfolio resourcing impact due to resource supplier disruptions and a highly volatile resource market leads to disruptions (schedule change 3 months - <6 months) to projects/programs. 	 Delay in DSP registration because of developer unwillingness to pay leading to: Funding shortfall leading to financial loss (\$10M - \$30M) for Sydney Water. Sydney Water does not register DSP in time (schedule change 3 months - <6 months). 	 Private property access not available within the allocated time (e.g. customer response or acceptance) leads to: Delays in investigation and delivery of work Delayed access for survey, field work or construction plant Schedule change 3 months - <6 months 	 Thrive SW Procurement process and timings take longer scheduled (critical path) Takes longer to complete works than planned, re longer (3 months - <6 months) to drive take-up
Moderate	 IPART budgets will not be sufficient to cover OPEX costs (\$10M - \$30M) Requirement to return to IPART requesting realignment of financial targets split requiring significant effort to develop supporting materials Project prioritisation and solution decisions made on basis of capitalizable costs rather than best solution for SW Future IPART funding decisions less favourable to Sydney Water 	 Enviro planning pathway approval delays lead to: Increased cost (\$1M - \$10M) and time associated with obtaining approvals. Subject to community /agency feedback. Additional development consent requirements that would need to be adhered to (i.e. Conditions of Approval) 	 Failure to deliver Preliminary Works within the required timeframe (schedule change 1 month - <3 months) leads to failure to meet project deadlines (Court Orders) Insurance not paying complete costs leads to financial cost (\$100K - \$1M) to Sydney Water. 	 Thrive Adherence to schedule, hampered by traffic mar given there is single goods lifts, parallel construct teams leads to: Delays to construction (1 month - <3 months) ca potential bottlenecks with getting materials up to
Minor	 Increased COVID restrictions lead to: Increased number of team members working remotely Problem solving timelines may increase (2 weeks - <1 month) Team members feel less connected to the organisation Decision making timing may increase (2 weeks - <1 month) 	 COVID-19 - impacts during design development phase (reference design and REF) and delivery phase leads to: Added costs (\$100K - \$1M) to comply Delays (schedule change 2 weeks - <1 month) in event of closure or lockdowns if cases break-out 	 Flooding due to heavy rain leads to: Erosion (increased costs \$10k - \$100k) Lack of access to site (schedule change 2 weeks - <1 month) 	 Thrive Completion of stage 1 construction of work floors delayed (2 weeks - <1 month) by not being able out floors (declutter) sufficiently for construction.
Minimal	 The 2 CDC offshore resources are new to the project, while they're experienced with CDC, they may be slow in resolving open defects leading to: Delayed resolution of SIT defects (<2 weeks delay) 	 Delay to project timeline if PPP model selected as preferred leads to: Delay to project timetable (schedule change <2 weeks) Added costs (<\$100K) incur for procurement 	 Impacts to Penrith STP operation impacts treatment process or effluent discharge resulting in: Project delays (schedule change <2 weeks) Increased costs (<\$10K) 	 Thrive Any delays to delivery of replacement Click Platf beyond end 2023 will result in a business-critical without any support result in business downtime, (<2 weeks) to BCP

am	Business Development
	 Urban Plunge Pool Prospect Effectively manage all risks associated with a temporary public pool. Site is promoted well and too many patrons wish to participate. Activities attracts more visitors than can be managed on the site leading to possible serious injuries and legal action (>\$1M damages)
	 Urban Plunge Pool Prospect Deliver a safe and engaging Urban Plunge temporary pop-up pool event at Andrew Campbell Reserve, Prospect Reservoir. Not being able to work to agreed timing or changes to design/scope leads to delays (6 months – 12 months) with SW planning approval processes
er than esulting in	 Urban Plunge Pool Prospect Deliver a safe and engaging Urban Plunge temporary pop-up pool event at Andrew Campbell Reserve, Prospect Reservoir. Scheduling delays and/or not being able to procure the pools lead to not being able to deliver the pools in time for launch (possibly 3 months)
agement tion, and use by floors	 Urban Plunge Pool Prospect Deliver value for money: ensure we deliver maximum value to those attending the pop-up, Sydney Water teams and our partners. Unknown costs accrue to go over budget leading to cost overruns (\$1M - \$10M) due to inflation, shortage of staff, trades people.
s is to clean	 Urban Plunge Pool Prospect Effectively manage all risks associated with a temporary public pool. Multiple parties involved leads to risks/ responsibility falling between the cracks with pool company, event management company, their suppliers and Sydney Water. Could result in extended lead times (2 weeks - <1 month) and costs (\$100K - \$1M)
orm system reversion	 Urban Plunge Pool Prospect Effectively manage all risks associated with a temporary public pool. Vandalism and breach of security of infrastructure leads to graffiti (<\$10K)



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