Appendix E Human Health and Ecological Risk Assessment – Workover Activities

Human Health and Ecological Risk Assessment – Workover Activities

Prepared for : AGL Energy Limited

30 October 2013

Document History and Status

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Limitations

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It is prepared in accordance with the scope of work and for the purpose outlined in the Section 1 of this report.

The methodology adopted and sources of information used are outlined in this report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions. No indications were found that information contained in the report provided by AGL was false.

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Section 1 Introduction

1.1 General

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by AGL Energy Limited (AGL) to undertake a human health and ecological risk assessment (HHERA) for its Workover activities at the Camden Gas Project, New South Wales (NSW).

The HHERA is required to address a Notice of Variation of Licence No. 12003 from the NSW Environment Protection Authority (EPA) (Notice Number 1503210 dated 22 December 2011). Under Section 8 of the Licence Variation, Pollution Studies and Reduction Programs, Condition U5.1, AGL has been required to provide the following:

1. *"A report detailing the Hydraulic Fracturing that has been used at Camden in the past;*
2. *A summary report on the number and location of wells that have been Fracture Stimulated, and when;*
3. *Details of the concentrations and volumes of the chemicals used and proposed to be used during the hydraulic fracturing process;*
4. *A description of how many uncontrolled releases have occurred during drilling, hydraulic fracturing and well Workovers at Camden, and how these were managed;*
5. *A description of fracture monitoring, and geological monitoring used and proposed to be used at Camden to assess fracture and chemical migration from the target coal seam gas water bearing zones into adjacent aquifers;*
6. *A detailed description of the procedures and work practices used and proposed to be used during hydraulic fracturing;*
7. *A risk assessment on the chemicals used and proposed to be used in Hydraulic Fracturing;*
8. *Information on how AGL will monitor the recovery of any chemicals used and proposed to be used during Hydraulic Fracturing;*
9. *A summary report of the number and location of Well Workovers carried out at Camden since 01 February 2006, and when the well Workovers occurred;*
10. *A list of all chemicals and constituents used and proposed to be used during Well Workovers;*
11. *Details of the concentrations of the chemicals used and proposed to be used during Well Workovers;*
12. *Provide a description of type of Well Workovers operations conducted and proposed to be conducted, including objectives, frequency of work, and duration of activities;*
13. ***A risk assessment on the use of chemicals used and proposed to be used in Well Workovers****; and*
14. ***Information on how AGL monitors and proposes to monitor the recovery of any chemicals used during Well Workovers.****"*

The HHERA addresses conditions U5.1.13 and U5.1.14.

1.2 HHERA Methodology

1.2.1 General Approach

The methodology adopted for the conduct of the HHERA is in accordance with the protocols/ guidelines recommended by enHealth ("*Health Impact Assessment Guidelines*" (2001) and "*Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards*", 2012) and NEPM (Schedule B(4), "*Guideline on Health Risk Assessment Methodology*", 1999).

The framework for an ecological risk assessment is similar to the one adopted for the human health risk assessment and is consistent with guidance provided in NEPM ("*Guideline on Ecological Risk Assessment*", Schedule B(5)) and in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000).

In addition to the above the assessment has also considered the following:

- Methods for the calculation of drinking water guidelines as outlined in the National Health and Medical Research Council, Australian Drinking Water Guidelines (NHMRC 2011).
- Methods for the assessment of toxicity as outlined in the National Water Quality Management Strategy, as outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000).

These guidance documents have been endorsed by the NSW EPA for the conduct of HHERA's in NSW.

The HHERA presented in this report is a qualitative assessment. The above guidance provides the basis for conducting both qualitative and quantitative assessments, however the guidance is more focused on quantitative evaluations. To assist in the qualitative evaluation of risk, a risk matrix approach has been adopted to assist in the ranking of key risk issues that need to be considered in evaluating the chemicals used in well Workover activities.

The approach adopted is generally consistent with the requirements presented in Australian Standard/New Zealand Standard (AS/NZS) 4360:2004: Risk Management and AS/NZS ISO 31000:2009 Risk Management - Principles and Guidelines, with some modification of the qualitative definitions to ensure they are relevant to the HHERA conducted.

For the use of chemicals with well Workover activities, the following key aspects have been considered:

1.2.2 Risk Issues

This general review is aimed at providing an evaluation of the key aspects, relevant to the chemicals assessed, that affect the potential for exposures by humans or ecological receptors to occur. In relation to well Workover activities the risk issues that warrant consideration relate to:

- operational risks associated with the storage, handling and use of the chemicals; and
- human health and environmental risks associated with the potential for the surrounding environment, including humans, to be exposed to chemicals used during well Workover activities.

1.2.3 Consequence

On the basis of the available information, hazards associated with the chemicals have been evaluated with the potential for consequences to be of significance identified. The following aspects have been considered in this evaluation:

- Concentrations at the point of use;
- Chemical and physical properties – evaluated in conjunction with other aspects as outlined below;
- Fate and transport in groundwater – presents consideration of the potential for the chemicals to have negligible, low, medium, high or very high potential to migrate to and move with groundwater, be persistent in the environment, bioaccumulate in aquatic species and/or the food chain;
- Human toxicity – presents consideration of the potential for the chemicals to result in negligible, low, medium, high or severe acute and chronic human health effects that are relevant to operational exposures (in particular occupational) and offsite environmental exposures; and
- Ecological toxicity – presents consideration of the potential for the chemicals to result in negligible, low, medium, high or severe toxicity to aquatic species.

On the basis of these properties, the following presents a summary of the categories and ranking system identified for the purpose of conducting a qualitative evaluation of potential consequences of exposure, both operational and environmental exposures.

Table 1 Summary of Consequence Categories and Ranking System

Rank	Consequence Descriptor	Occupational Exposures	Environmental Exposures		
			Potential for Off-Site Impacts – Fate and Transport	Off-Site Impacts to Human Health	Off-Site Impacts to the Ecosystem
1	**Negligible**	Generally low potential for adverse health effects during storage and handling	Chemical degrades rapidly under all conditions, is not bioaccumulative or taken up into the food chain	No adverse long-term health effects associated with low level environmental exposures	Negligible potential for adverse effects on aquatic ecosystem
2	**Low**	Minor nuisance effects such as odours, transient irritation effects, requires low level PPE	Chemical is somewhat mobile, degrades slowly (or only under some conditions), is not bioaccumulative or taken up into the food chain	Minor transient health effects or odour	Low potential for adverse effects on aquatic ecosystem
3	**Moderate**	Transient effects that may require medical treatment such as respiratory effects, more significant irritation effects that need to be managed with moderate level PPE	Chemical is mobile, degrades slowly, is not bioaccumulative or taken up into the food chain	Transient effects that may require medical treatment such as respiratory effects, more significant irritation	Moderate potential for adverse effects on aquatic ecosystem
4	**High**	Permanent health effects that require extended medical treatment and/or	Chemical is mobile, persistent, has the potential for low to moderate	Permanent health effects that require extended medical treatment	High potential for adverse effects on aquatic ecosystem

Rank	Consequence Descriptor	Occupational Exposures	Environmental Exposures		
			Potential for Off-Site Impacts – Fate and Transport	**Off-Site Impacts to Human Health**	**Off-Site Impacts to the Ecosystem**
		permanent disability and require a high level of PPE, monitoring and management	bioaccumulation in aquatic species or food chain	and/or permanent disability	
5	**Severe or very high**	Death or significant injury likely to result in death - not to be used	Chemical is mobile, persistent, has the potential for high to very high bioaccumulation in aquatic species or food chain	Death or significant injury likely to result in death	Very high potential for significant adverse effects (including death of significant proportion of receptors) in ecosystem

1.2.4 Likelihood

The next step is to determine the likelihood of the hazard (i.e. exposure occurring at the receptor that may include human or ecological receptors) occurring. While the assessment of likelihood also needs to consider more site-specific aspects, the more general information on well Workover activities is considered sufficient to provide a general measure of likelihood. The likelihood measure is only considered in the evaluation of environmental exposures as these exposures are dependent on the fate and transport of chemicals in the environment. The likelihood of occupational exposures (by workers involved in well Workover activities) is directly managed through the implementation of appropriate occupational health and safety policies and plans. These policies and plans are implemented and monitored by AGL which results in the likelihood of occupational exposures occurring being managed at a level where such exposures are always considered to be highly unlikely. The assessment presented here has been used to identify those chemicals used in well Workover activities that require more significant levels of protection under the occupational health and safety plan.

The measure is split into five descriptors ranging from hazards that are considered 'Very likely' to hazards that would be considered 'Highly unlikely' as outlined in **Table 2**.

Table 2 Summary of Likelihood Categories and Ranking System

Rank	Descriptor	Likelihood of Exposure
1	Highly unlikely	No connection between coal seam and receiving environment, no pathway of exposure
2	Unlikely	Unlikely connection between coal seam and receiving environment, no extraction and use of aquifers for any purpose. Unlikely for any surface spills to reach receiving environment.
3	Possible	Possible connection between coal seam and receiving environment, possible extraction and use of aquifer. Possible that surface spills to reach receiving environment.
4	Likely	Likely connection between coal seam and receiving environment, potential use of aquifer or discharge to ecosystem. Likely that surface spills to reach receiving environment.
5	Very likely	Confirmed connection between coal seam and receiving environment, confirmed use of aquifer or discharge to ecosystem. Very likely that surface spills to reach receiving environment.

1.2.5 Qualitative Characterisation of Risk

The final step in assessing hazard and risk is to combine the potential likelihood (of exposure occurring for a receptor) and consequences determined using the above ranking system and descriptors to evaluate the level of overall risk. The approach adopted in this HHERA is based on a qualitative risk matrix approach generally consistent with AS 4360:2004 and AS/NZS ISO 31000:2009, where the following risk matrices have been considered for occupational and environmental risk issues.

Table 3 Matrix Adopted to Characterise Occupational Risk Issues

	Consequence →				
	Negligible	Low	Moderate	High	Severe
Acute Hazards Associated with Storage and Use of Chemical	Generally low potential for adverse health effects during storage and handling	Minor nuisance effects such as odours, transient irritation effects, requires low level PPE	Transient effects that may require medical treatment such as respiratory effects, more significant irritation effects that need to be managed with moderate level PPE	Permanent health effects that require extended medical treatment and/or permanent disability and require a high level of PPE, monitoring and management	Death or significant injury likely to result in death - not to be used
	1	2	3	4	5

Table 4 Matrix Adopted to Characterise Environmental Risk Issues

				Consequence				
				Negligible	Low	Moderate	High	Severe
		Potential for Off-Site Impacts - Fate and Transport		Chemical degrades rapidly under all conditions, is not bioaccumulative or taken up into the food chain	Chemical is somewhat mobile, degrades slowly (or only under some conditions), is not bioaccumulative or taken up into the food chain	Chemical is mobile, degrades slowly, is not bioaccumulative or taken up into the food chain	Chemical is mobile, persistent, has the potential for low to moderate bioaccumulation in aquatic species or food chain	Chemical is mobile, persistent, has the potential for high to very high bioaccumulation in aquatic species or food chain
				1	2	3	4	5
		Off-Site Human Health Issues (chronic)		No adverse long-term health effects associated with low level environmental exposures	Minor transient health effects or odour	Transient effects that may require medical treatment such as respiratory effects, more significant irritation	Permanent health effects that require extended medical treatment and/or permanent disability	Death or significant injury likely to result in death
				1	2	3	4	5
		Off-Site Impacts to Aquatic Ecosystem		Very low potential for adverse effects on aquatic ecosystem	Low potential for adverse effects on aquatic ecosystem	Moderate potential for adverse effects on aquatic ecosystem	High potential for adverse effects on aquatic ecosystem	Very high potential for significant adverse effects on aquatic ecosystem
				1	2	3	4	5
				Negligible	Low	Moderate	High	Severe
Likelihood of Exposure at Receptor	Confirmed connection between coal seam and receiving environment, confirmed use of aquifer or direct discharge to environment/ecosystem	very likely	5	N	L	M	H	E
	Likely connection between coal seam and receiving environment, potential use of aquifer or discharge to local environment/ecosystem	likely	4	N	L	M	H	E
	Possible connection between coal seam and receiving environment, possible use of aquifer, limited management measures in place to prevent surface spillage (hence possible for surface spills to reach environment)	possible	3	N	L	M	M	H
	Unlikely connection between coal seam and a receiving environment, no use of aquifers for any purpose, management measures in place that make spills at ground surface unlikely	unlikely	2	N	L	L	L	L
	No connection between coal seam and receiving environment and management measures in place to prevent surface spills	highly unlikely	1	N	N	N	N	N

The overall risk outcomes have been determined as follows:

Table 5 Risk Outcomes

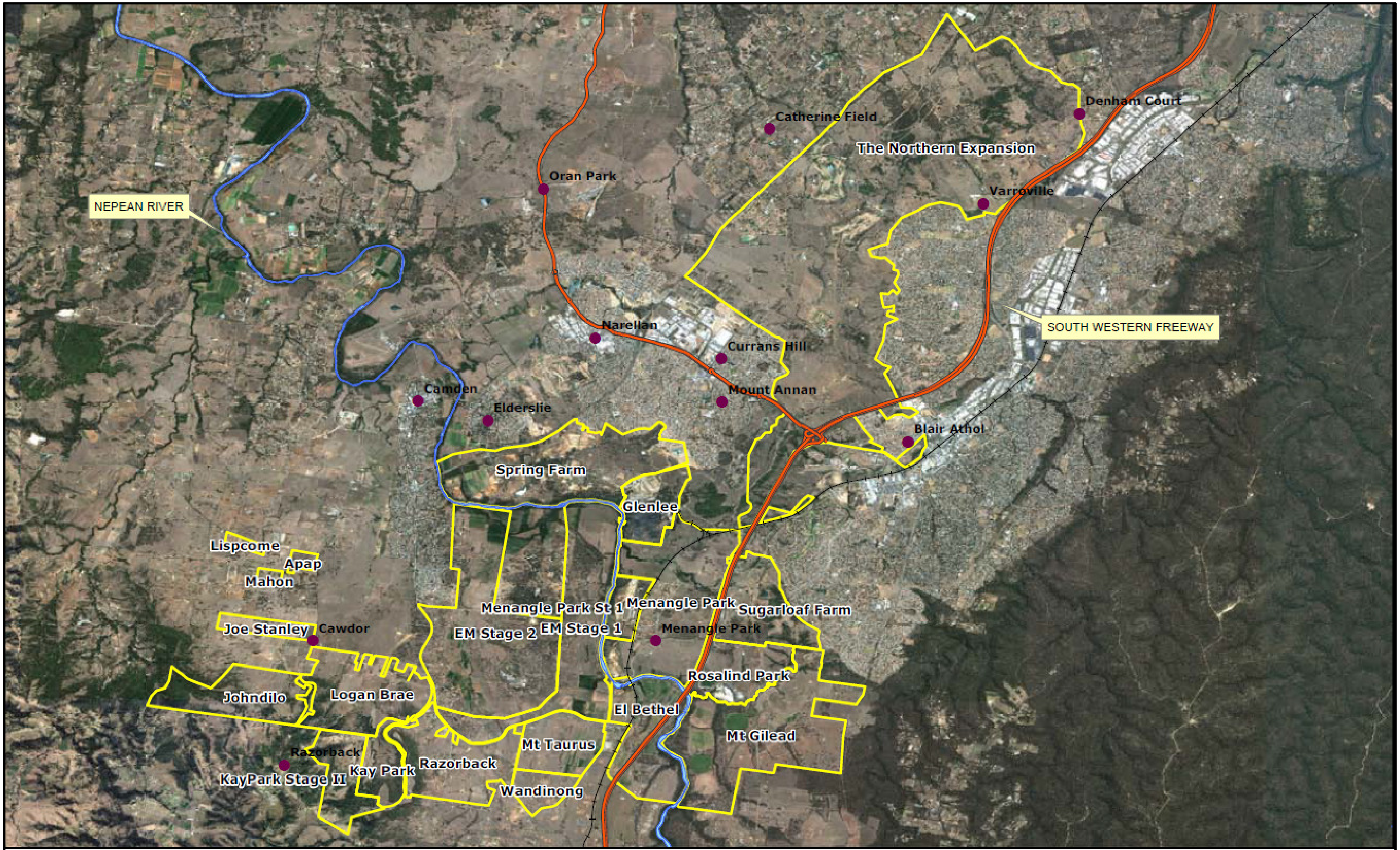
Rank	Description
N	Negligible risk - no adverse impacts
L	Low risk - potential for impacts is very low and potential for impacts to result in adverse effects is low. Risk issues identified can be effectively managed through implementation of appropriate management measures.
M	Medium risk - risk considered to be higher than identified in low risk category, risks should be quantified and management may be required
H	High risk - potential for significant exposures that have the potential to exceed acceptable risk levels for human health or ecological environments
E	Extreme risk - significant heath and/or ecological effects may occur

1.3 Study Area

The study area comprises AGL operations in the Camden area, approximately 60 kilometres (km) southwest of Sydney in NSW. These wells extract coal seam gas from the Illawarra coal measures, within the Southern Coalfields of the Sydney Basin. The current operations comprise 130 coal seam gas (CSG) wells, access roads, a high pressure pipeline, underground gas gathering lines and gas treatment facilities. An Environmental Assessment has been completed (AGL, October 2010) for the Northern Expansion of the Camden Gas Project. The existing and proposed areas lie within the Petroleum Exploration Licence 2 (PEL 2) that extends from Newcastle to Wollongong and include 5 Petroleum Production Lease (PPL) areas. Operations within these areas have been conducted over various areas with the current extent of the Camden Gas Project illustrated in **Figure 1**.

Most of the current and proposed operations are in an area that is largely undeveloped and is generally semi-rural in character, with agricultural lands, predominantly used for grazing, scattered between isolated areas of remnant vegetation and land designated for future (residential, commercial and industrial) development.

The operations are currently located within the Hawkesbury-Nepean and Georges River sub-catchments. The Hawkesbury-Nepean catchment is large and covers a total area of approximately 22 000 km^2. The Georges River catchment covers nearly 1,000 km^2, covering 14 local government areas and a large portion of the Sydney metropolitan area. These catchments include the Nepean River; Georges River; Kemps Creek; a number of tributaries that include Bunbury Curran Creek, Cottage Creek and South Creek; a number of ephemeral creeks and perennial water bodies and dams (AGL, 2010).



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Author:	Upstream Gas
Date:	21/10/2010
Ref:	2574

Camden Gas Project Stages

Kilometres

0 3 6

Scale 1:85,000

Geocentric Datum of Australia 1994

Sources: AGL Energy Limited, MapData Sciences, SKM

Legend

- ● Towns
- Major Highway
- Railway Line
- Neapen River
- Camden Gas Project

N

Figure 1

1.4 Geology

The coal seam methane resources are contained within rocks of Permian age and are the upper coal measure sequences known as the Illawarra Coal Measures. They lie conformably beneath the Triassic age Narrabeen Group of sandstones. In the study area the Illawarra Coal Measures are located at depths exceeding 500 metres below the surface for the most part, and can range in thickness from 50 metres to 300 metres, and in the east towards Sydney approach 450 metres thick. Nett clean coal acting as a gas reservoir within the coal measures approximates 15 – 20 metres within a typical thickness of coal measures of 250-300 metres. Gas content of the coal is commonly greater than 10 m^3/tonne and can be as high as 25 m^3/tonne. However not all the coal seams are suitable for gas production; for example, the thick Wongawilli seam is less favoured as a reservoir than the thinner Bulli seam which has higher permeability. The other seam of interest for CSG production is the Balgownie coal member.

The stratigraphy of the Southern Sydney Basin is presented in **Figure 2** *(from New South Wales Coal Seam Methane Potential – March 1996 – Fig 7, p 26. Geological Survey of NSW, Coal and Petroleum Geology, Petroleum Bulletin 2).*

The Illawarra Coal Measures are a thick sequence of sedimentary rocks being principally sandstones and shales with some reasonably thick, laterally extensive coal seams. The most sought after seam for both mining and gas is the Bulli seam which has higher permeability. The Wongawilli and American Creek seams, while having a combined thickness of approximately 16 metres, are less favoured due to lower permeability.

The sedimentary rocks overlying the Illawarra Coal Measures are sandstones and claystones of the Narrabeen Group, which in turn are overlain by the Middle Triassic aged Hawkesbury sandstone, the Mittagong Formation and the shales of the Wianamatta Group. At the surface there are unconsolidated alluvial deposits along the major rivers. The sandstones of these overlying groups of rocks are well recognised throughout the Sydney Basin for their development of spectacular cliffs, and while some individual rock units – largely the Hawkesbury Sandstone – are aquifers containing fresh to brackish water, most of the rock units both immediately above and below the coal measures are quite impermeable and as a consequence, the small volumes of interstitial water present tend to be saline. It is noted that the coal seams in this area do not generally contain large volumes of formation water and the formation water present tends to be slightly to moderately saline.

In places the sedimentary rocks and coal seams are cut by volcanic intrusions and flows, and in some locations they are also cut and displaced by faults.

1.5 Surface Water and Groundwater

The study area is located within the Nepean River Catchment, a sub-catchment of the Hawkesbury-Nepean River Catchment System. The proposed expansion extends to include the Georges River Sub Catchment. These catchments comprise the Nepean and Georges Rivers and associated tributaries that flow into these rivers. Within the study area these tributaries are generally located within the headwaters of the catchments and are largely intermittent and ephemeral creeks with limited base flow. The Nepean and Georges Rivers are subject to flooding in the Camden and surrounding region and areas of the study area are located in relatively low-lying and flood prone areas. A number of perennial water bodies and dams are also located in the study area.

As discussed above (**Section 1.4**) the geology of the study area comprises regionally significant and continuous low permeability shale and claystone units that provide an effective barrier between the alluvial and Hawkesbury Sandstone aquifers and the Illawarra Coal Measures. The presence of this natural barrier and the inherent low permeability of the coal measures are responsible for the low produced water yield of the coal seam methane extraction process. Water quality within the coal formation waters is slightly to moderately brackish in nature, while fresher water is generally located within the Hawkesbury Sandstone or alluvial aquifers located a significant distance above the Illawarra Coal Measures.

Any groundwater extraction and use within the study area for irrigation or other purposes is associated with abstraction of water from the Hawkesbury Sandstone or alluvial aquifers. These are well separated from the Illawarra Coal Measures that are subject to CSG operations at depth of 500 to 700m below ground surface.

1.6 Receiving Environment

The Camden Gas Project covers a large area that is utilised for a range of land uses. This includes rural and semi-rural areas and urban areas. Hence there is the potential for the general public who live and/or work within and adjacent to the study area to be exposed to chemicals used in CSG operations should they be present in surface water (creeks, local rivers and local dams), soil and/or groundwater. Groundwater resources in the study area comprise fresh to brackish water aquifers in the upper alluvial and Hawkesbury Sandstone formations. These aquifers have the potential to be used for a range of beneficial uses that are likely to include irrigation, stock watering and limited ecosystem dependence. The aquifers are not suitable for drinking water but are suitable for some general domestic and garden uses. While unlikely to be used for this purpose, there is the expectation in the local community that these aquifers remain suitable for all these uses.

The study area comprises a wide range of terrestrial environments and aquatic environments (that have been evaluated by AGL during the Environmental Assessment stage of each of the project areas). If chemicals used in the CSG operations have the potential to discharge into these environments then there may be the requirement to conduct a more detailed evaluation of potential impacts. However this would only be relevant if there was a sufficiently elevated level of risk identified for these receptors.

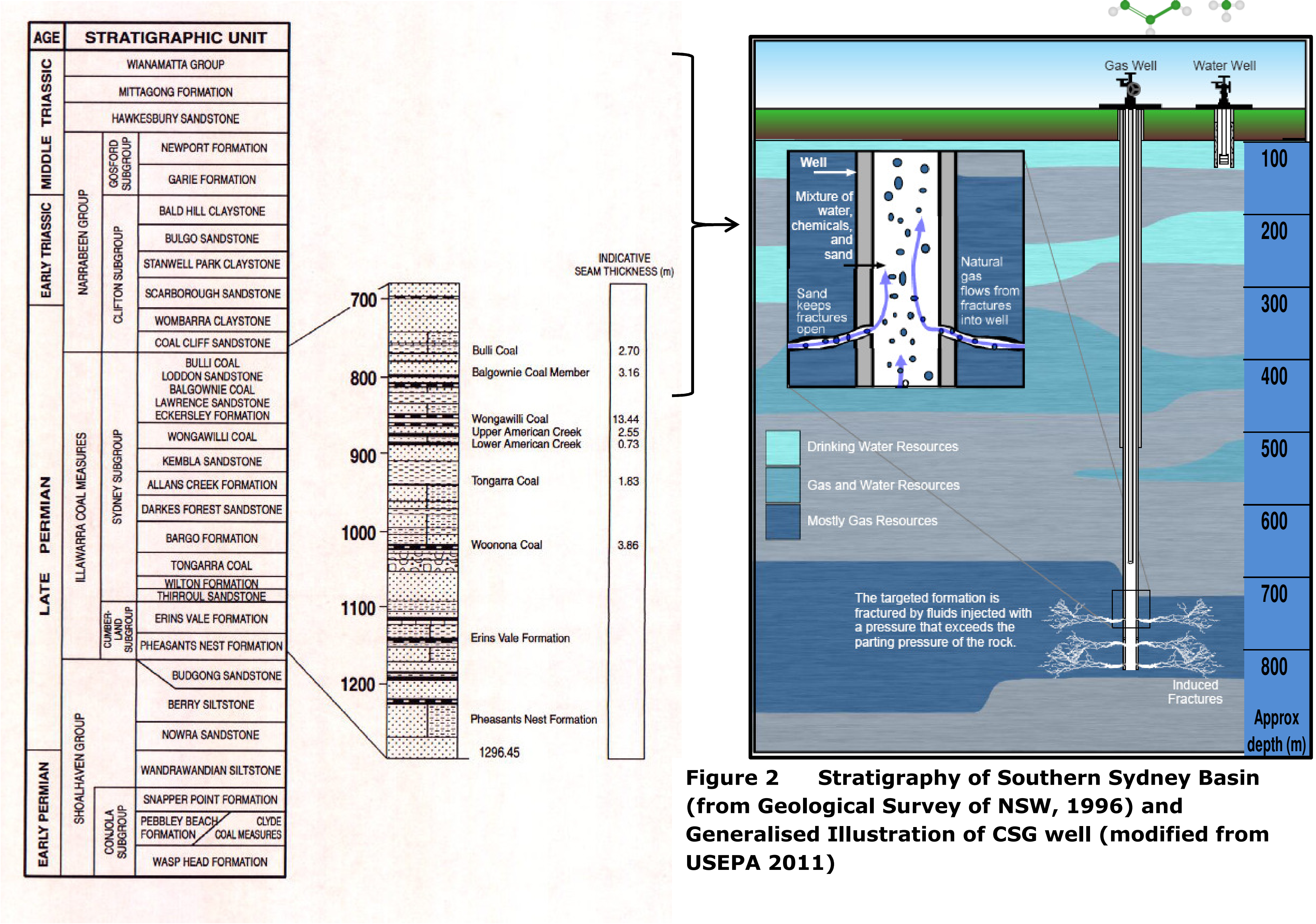

Figure 2 Stratigraphy of Southern Sydney Basin (from Geological Survey of NSW, 1996) and Generalised Illustration of CSG well (modified from USEPA 2011)

Section 2 Operations

2.1 Description of AGL Operations

2.1.1 Drilling Techniques

The two types of well installation techniques employed by AGL Camden are:

- Vertical Drilling: Vertical wells (most of which have been fracture stimulated) are the primary gas well type in the area. Wells are drilled vertically to intercept the Bulli and Balgownie Coal Seams. Wells have multiple casings with a conductor casing near surface, a surface casing to around 100m to exclude shallow aquifers and a production casing to full depth. All casings are pressure cemented in place.
- Horizontal Drilling / Surface to In-Seam (SIS): Horizontal wells are used to increase the drainage area of a reservoir and provide a means of stimulating the reservoir through the drilling process. The well is drilled vertically from the surface and gradually builds angle so as to intersect the seam near parallel with the seam dip angle. Once intersected, this portion of the well bore is cased, cemented and a smaller hole is subsequently drilled through the seam anywhere from about 1300 to 2500m. It allows a significant reduction in the number of surface locations along with the ability to access previously sterilised gas reserves.

The more recent drilling programs conducted by AGL have been entirely horizontal wells with multiple wellheads on single pads so as to minimise the land use impacts.

2.1.2 Well Construction

The construction of a well is often influenced by whether or not a hydraulic fracture stimulation is going to be performed. If it is, then the well needs to be designed and completed to accommodate for the requirements of the fracture treatment. Treatment pressures, casing specifications, zonal isolation, flow rates, monitoring and flowback requirements can greatly influence a wells construction.

The Code of Practice for well construction has been adopted by AGL and complies with the American Petroleum Institute (API) standards and best practice for wells that will be fracture stimulated. All gas production wells have been and will be completed with multiple casings (and pressure cemented in place) to ensure that aquifers remain isolated.

Figure 3 presents cross-sectional illustrations of the well construction demonstrating the level isolation that is achieved with the construction methodology.

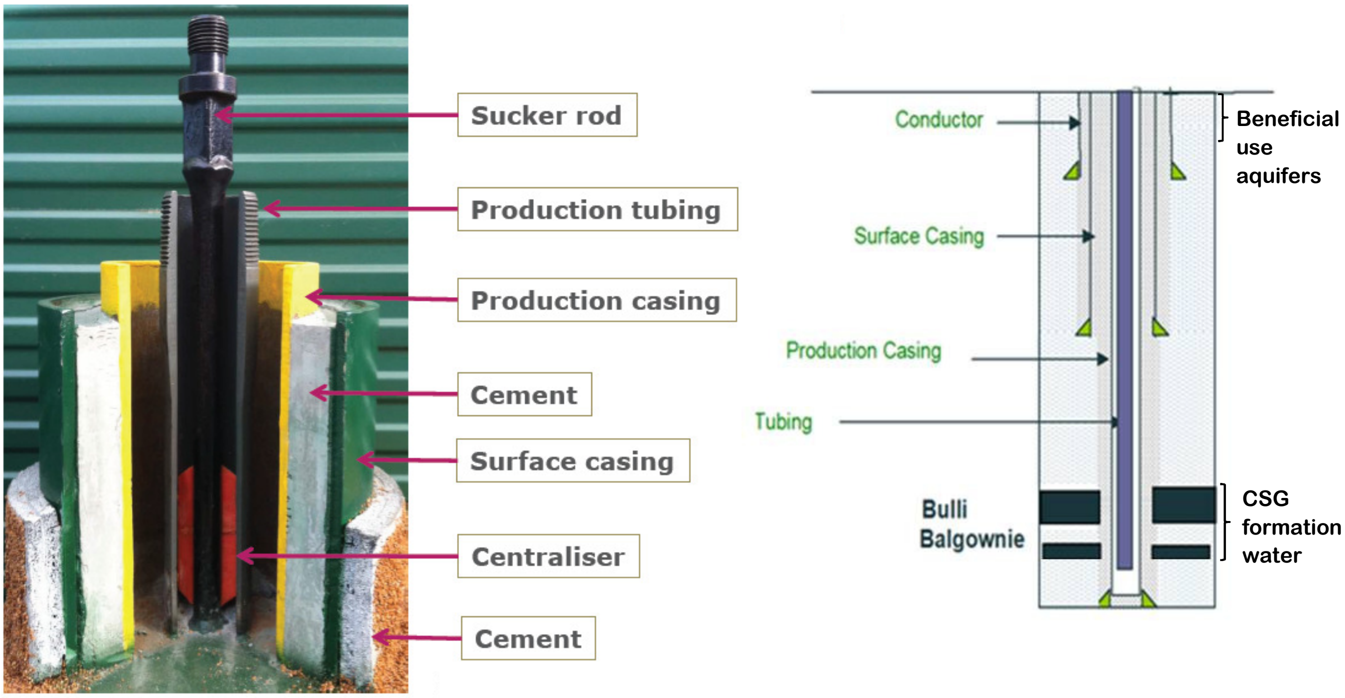

Figure 3 Typical Well Construction (from AGL)

2.1.3 Well Workovers

Workovers are performed when there is a loss of either gas production or water production from the well and work is required to restore the well's flow. Workovers are generally conducted inside the cased well. The workover rig is brought onto a well whenever anything needs to be lifted from the wellbore and conduct such maintenance works. For all workover activities undertaken by AGL a comprehensive work program, specific for the particular well on which the workover is to be carried out, is put together which outlines the steps to be undertaken and the chemicals which are to be used on the well. These activities may result in water (that includes chemicals used in the well) being produced. This water is collected into aboveground tanks for characterisation and disposal (as per EPA guidance). The storage and use of chemicals during Workover activities has been evaluated in this assessment.

2.2 Potential Impact of Well Workovers

The focus of this report is on the potential for chemicals used in well Workover activities to be of concern to human health or the environment. Hence AGL operation methods and procedures have been reviewed further in conjunction with the available information on the study area to identify and evaluate the potential for impacts to occur and be of potential significance. **Table 6** presents a summary of the potential impacts identified.

Other impacts associated with CSG operations (associated with earthworks, traffic and construction) are separately evaluated and managed/addressed by AGL. While these activities have the potential to result in impacts to the environment, they are not related to the use of chemicals during Workover activities and are not further evaluated in this assessment.

Table 6 Summary of Potential Impacts and Likelihood - Well Workover Activities

Development Phase and Potential Impacts	Likelihood*	Comments and Management Measures
Well construction results in interconnectivity between target coal seam and upper aquifers resulting in chemicals used in the well during Workover activities contaminating these upper, more shallow aquifers where regional beneficial uses (irrigation, stock water, drinking water, protection of the environment) may be important	1	As outlined in **Section 2.1.2** the methodology for well construction makes it highly unlikely that any interconnection between aquifers will be created during well construction. The target coal seam is expected to be well isolated.
Storage and handling of Workover fluids/chemicals may result in exposure by workers involved in well construction activities	1	AGL occupational health and safety protocols are employed to manage and mitigate workplace exposure risks that align with the corresponding MSDS.
Accidental spillage of Workover fluids/chemicals, including flowback water, may result in exposures by workers and/or runoff to the adjacent environment (terrestrial or local aquatic environments where present)	1 to 2	AGL operational procedures are in place to minimise the potential for these impacts to occur. In particular, fluids are stored in bunded areas with onsite spill kits, all onsite personnel wear necessary PPE, well siting requirements ensures that wells are not located within 40m of a creek, flowback water is stored within lined ponds or aboveground tanks that are not affected by rainfall (including flooding), a Soil and Surface Water Management Plan, Emergency Response Plan and Flood Management Plan has been developed and implemented by AGL for all operations to mitigate the potential for any runoff to adjacent environments. It is noted that the volume of fluids used during the Workover activities is very low, hence the likelihood of release is considered to be low.

* Refer to **Table 2** for description of these indicators

On the basis of the above, the only pathways by which chemicals used in Workover operations may be released to the environment where exposures may occur by aquatics and terrestrial receptors, workers and other members of the public is via accidental spill and releases of fluids, products and flowback water. These accidental spills and releases occur as a result of aboveground operations and may result in direct exposures. No pathways of exposure have been identified by which subsurface operations associated with well Workover activities can result in the discharge or release of chemicals to an overlying freshwater aquifer that may be used for any beneficial use or discharge to a receiving waterbody.

AGL monitors the recovery of any acid used during well Workovers. Produced water samples are collected regularly from the well following the completion of the well Workover and the pH is tested to confirm that the acid used has been spent. If required, AGL can raise the pH of produced water to a neutral state prior to disposal at a licensed facility.

Based on the implementation of a range of risk management measures by AGL, accidental spills and releases of these chemicals/fluids is considered to be unlikely.

While unlikely, the potential for chemicals released to result in harm to human health or the environment has been evaluated further in the following section.

Section 3 Chemical Hazard Assessment

3.1 General

The review presented in this report has focused on chemicals proposed to be used in future well Workover operations.

3.2 Chemical Information

To assist in the evaluation of the potential for the chemicals used in well Workover activities to be of concern with respect to the human health or the environment, the following information has been compiled and reviewed:

Physical/Chemical Data

Physical and chemical information on the chemicals were obtained from the following sources:

- Material Safety Data Sheets (MSDS) provided by the three companies for the products proposed to be used in well Workover activities (included in **Appendix B**);
- Hazardous Substances Databank (HSDB), accessed in February 2012;
- Published chemical reviews or assessment reports (as referenced for each chemical); and
- Modelled from the USEPA (2009) EPISUITE (Estimation Programs Interface Suite, Version 4.10, 2011). This program incorporates USEPA peer-reviewed modelling programs for the estimation of physical/chemical data, environmental fate and ecotoxicity data for organic chemicals.

Environmental Fate and Transport

Fate and Transport of the Workover chemicals in the environment have been evaluated on the basis of the following:

- Volatility of the compound – potential for the chemical to partition to the vapour phase from water (based on Henry's Law constant) or soil (based on vapour pressure) and hence be present in air at any significant concentration;
- Mobility in the environment – potential to migrate to and discharge to a receiving environment has been evaluated on the basis of the solubility of the compound in water (more soluble compounds prefer to stay in solution and be more mobile) and Koc (the potential for the compound to adsorb to organic matter present in soil or sediments, limiting mobility);
- Potential to accumulate in the food chain or aquatic/terrestrial species – the potential for chemicals to bioaccumulate has been assessed on the basis of calculated bioconcentration factors (BCF). Where these are not available the potential for chemicals to be considered bioaccumulative has been based on the nature of the chemical to be absorbed and eliminated; and
- Potential for degradation in the environment – the potential for degradation to less toxic (or in some cases more toxic) species is of importance. Some chemicals rapidly degrade to non-toxic compounds that regardless of mobility in the environment, will never be of concern. However there are other compounds that degrade more slowly and hence will remain in the environment for longer (potentially resulting in exposure and harm) or they may degrade to more toxic compounds that are more persistent in the environment. The potential for degradation in surface soil and surface water is of most relevance for this assessment.

The overall ranking of potential fate in the environment has been conducted on a qualitative basis using the measures outlined in **Table 1.**

Human Toxicity

The assessment of potential risk issues for human receptors needs to consider:

- occupational risks by workers who may be exposed during use of the chemicals/fluids or managing spill/release incidents. These issues more specifically relate to acute exposures and hazards; and
- chronic (long-term) health effects that may be relevant to exposures by all members of the public in the event that low concentrations of chemicals are present in soil or groundwater in an area where exposure can occur on a regular basis.

These health effects have been evaluated on the basis of published information from peer-reviewed sources, as identified and selected using enHealth (2012) guidance. It is noted that a number of chemicals have very limited data available and hence the studies available have been further evaluated for the purpose of determining the potential for adverse health effects to be of significance.

Where available, published guidelines for soil and water quality (stock, limited domestic or irrigation water quality) have been identified. More specifically published drinking water guidelines (i.e. concentrations in water that are safe for all members of the population to consume every day for a lifetime) have been identified and considered in this assessment. Where these guidelines are not available and the available published reviews have identified a suitable Tolerable Daily Intake (TDI) or No Observed Adverse Effects Level (NOAEL) this value has been presented and used to derive a preliminary drinking water guideline following guidance provided by the National Health and Medical Research Council (NHMRC, 2011) for the derivation of the Australian Drinking Water Guidelines. This has been undertaken on the basis of the following:

$$Preliminary\ Guideline\ (DWGp) = \frac{TDI\ x\ Body\ Weight\ x\ \%intake}{Water\ Consumption}$$

$$TDI = \frac{NOAEL}{Safety\ Factor}$$

Based on guidance provided by NHMRC (2011), a provisional guideline has been derived on the basis of a body weight of 70 kg, water consumption rate of 2 L/day and a %intake of chemicals from drinking water of 100% (assuming most of the chemicals considered are not common chemicals in the diet). The safety factor adopted would typically depend on a wide range of factors, however for the purpose of this assessment a default factor of 1000 has been adopted (to address intraspecies and interspecies variability and limitations/uncertainties with the database).

All relevant published drinking water guidelines or calculated preliminary drinking water guidelines are presented in **Appendix A**.

The comparison with drinking water guidelines (assuming water consumption) is the most stringent evaluation that is relevant for human health. There is no intention that the water will be used for, or contaminate, drinking water. The only possible exposure pathway is via an accidental spill, as dealt with in the risk analysis table (see **Table 6**).

Where a drinking water guideline is available or a preliminary guideline can be derived, this has been compared with the potential concentration that is likely to be present in well Workover chemicals (prior to dilution). This comparison has assistant in the determination of the potential consequences of exposure (should it occur).

It is noted that there are a number of chemicals where no suitable human health guidelines are available or relevant, hence the evaluation of these chemicals has been undertaken on a qualitative basis only.

The overall ranking of potential acute (occupation) and chronic health effects has been conducted on a qualitative basis using the measures outlined in **Table 1.**

Environmental Toxicity

The potential for adverse effects to a receiving environment to occur has been evaluated on the basis of the available published information/studies in relation to acute and chronic toxicity to species in the environment. Most of the available data relates to aquatic toxicity and this has therefore been assumed to be protective of terrestrial effects.

Toxicity values for ecological receptors for fresh or marine water quality guidelines that are relevant to a 95% protection level have been adopted from Australian guidelines, specifically ANZECC (2000). Where these guidelines are not available, toxicity values derived from relevant ecological studies (referred to as Tox(eco) values) have been identified. These are threshold concentrations in water relevant for the assessment of potential adverse effects in a range of ecological species (refer to **Appendix A** for further detail on the range of Tox(eco) values available for each of the chemicals considered in this assessment).

Where available, and relevant, the identified water quality guideline or Tox(eco) has been compared with the potential concentration that is likely to be present in well Workover chemicals (prior to dilution). This comparison has assisted in the determination of the potential consequences of exposure (should it occur).

It is noted that there are a number of chemicals where no suitable guidelines are available for evaluating ecotoxicity, hence the evaluation of these chemicals has been undertaken on a qualitative basis only.

The overall ranking of potential environmental effects has been conducted on a qualitative basis using the measures outlined in **Table 1.**

3.3 Summary of Chemical Reviews

Appendix A presents a summary of all the available information considered in relation to the parameters outlined in **Section 3.2**.

It is noted that there are a number of products used in well Workover activities that are insoluble solids where the only hazard relates to occupational exposures during use. These products include Portland and blended cement. These products require specific use of personal protective equipment (PPE) to ensure worker health and safety. Use of such PPE is addressed at an operational level by

AGL. If spilled, these solids do not leach or migrate and can be readily and easily cleaned up (as per AGL operational requirements). Hence no further detailed evaluation of impacts to human health or the environment has been presented for these products.

The ranking of potential consequence for all other chemicals proposed to be used in well Workover activities is summarised in **Table 7** (refer to **Appendix A** for details).

Table 7 Summary of Hazard Analysis of Chemicals used in Well Workover Activities

Compound	Hazard Ranking*			
	Fate and Transport	Occupational Risk Issues	Chronic Health Impacts	Ecological Impacts
Hydrochloric acid	2	3-4	2	3
Guar gum	1	2	1	1
Xanthum Gum	1	2	1	1
Polyglycol	1-2	2	1	1
Ethylene glycol monobutyl ether [EGBE]	2	2-3	2-3	1-2
Calcium Chloride	2	2	1	1-2
Potassium Chloride	1-2	2	1	1
Sulphamic Acid	2	3	1	3
Amine polymer derivative	2	1-2	2	3

* Refer to **Table 1** for descriptions of these ranking scores

Review of **Table 7** indicates that most of the chemicals utilised in well Workover activities are associated with negligible to low hazards to human health and/or the environment. There are some chemicals that are of greater concern should they be released to an environment where exposure may occur. The overall risk of the use of these chemicals depends not only on theses hazards, but the likelihood that exposure may occur. This is further discussed in **Section 4**.

Section 4 Risk Characterisation/Assessment

The evaluation of potential risks associated with the use of chemicals in well Workover activities in the Camden Gas Project has been evaluated on the basis of the risk assessment matrix presented in **Section 1.2.5** and the following information:

- available information in relation to the study area;
- chemicals proposed to be used in well Workover activities;
- the likelihood that chemicals used in Workover activities may be discharged to an environment where there is the potential for some level of exposure (human or ecological) (presented in **Table 6**); and
- the hazards (human health and ecological) identified for these chemicals (summarised in **Table 7**).

While a range of hazards have been identified in relation to the behaviour of the evaluated chemicals in the environment, occupational/acute hazards, chronic health effects and ecological impacts, the likelihood that any of these chemicals may be discharged into an environment where any level of exposure may occur has been evaluated as highly unlikely (no exposure pathway is present) or unlikely (in relation to the potential for accidental spills or releases of chemicals in fluids or flowback water). These evaluations are summarised on the risk matrix presented in **Table 8** (refer to **Tables 3 and 5** for risk definitions).

On the basis of the assessment presented, the following can be concluded in relation to risks associated with the proposed use of chemicals in well Workover activities:

- Risks to human health and the environment are considered to be negligible or low.
- The highest identified risk level is low which is considered to be a level of risk that can be adequately managed through the implementation of existing operational management measures.
- No significant risk issues have been identified that require detailed quantification of risk.
- AGL monitors the recovery of any acids used during well Workovers by regularly collecting produced water samples from the well following the completion of the well Workover, and testing the produced water pH to confirm that the acid used has been spent. If required, AGL can raise the pH of produced water to a neutral state prior to disposal at a licensed facility.

Table 8 Summary of Overall Risk Ranking for Chemicals used in Workover Activities

				Consequence				
				Negligible	Low	Moderate	High	Severe
		Potential for Off-Site Impacts - Fate and Transport		Chemical degrades rapidly under all conditions, is not bioaccumulative or taken up into the food chain	Chemical is somewhat mobile, degrades slowly (or only under some conditions), is not bioaccumulative or taken up into the food chain	Chemical is mobile, degrades slowly, is not bioaccumulative or taken up into the food chain	Chemical is mobile, persistent, has the potential for low to moderate bioaccumulation in aquatic species or food chain	Chemical is mobile, persistent, has the potential for high to very high bioaccumulation in aquatic species or food chain
				1	2	3	4	5
		Off-Site Human Health Issues (chronic)		No adverse long-term health effects associated with low level environmental exposures	Minor transient health effects or odour	Transient effects that may require medical treatment such as respiratory effects, more significant irritation	Permanent health effects that require extended medical treatment and/or permanent disability	Death or significant injury likely to result in death
				1	2	3	4	5
		Off-Site Impacts to Aquatic Ecosystem		Very low potential for adverse effects on aquatic ecosystem	Low potential for adverse effects on aquatic ecosystem	Moderate potential for adverse effects on aquatic ecosystem	High potential for adverse effects on aquatic ecosystem	Very high potential for significant adverse effects on aquatic ecosystem
				1	2	3	4	5
				Negligible	Low	Moderate	High	Severe
Likelihood of Exposure at Receptor	Confirmed connection between coal seam and receiving environment, confirmed use of aquifer or direct discharge to environment/ecosystem	very likely	5	N	L	M	H	E
	Likely connection between coal seam and receiving environment, potential use of aquifer or discharge to local environment/ecosystem	likely	4	N	L	M	H	E
	Possible connection between coal seam and receiving environment, possible use of aquifer, limited management measures in place to prevent surface spillage (hence possible for surface spills to reach environment)	possible	3	N	L	M	M	H
	Unlikely connection between coal seam and a receiving environment, no use of aquifers for any purpose, management measures in place that make spills at ground surface unlikely	unlikely	2	N	L	L	L	L
	No connection between coal seam and receiving environment and management measures in place to prevent surface spills	highly unlikely	1	N	N	N	N	N

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Appendix A Chemical Summaries – Well Workover Chemicals

Workover Fluid Additives (all water based fluid systems)

Trade Name	Supplier	Material / Chemical Description	Basic Function	Active Constituents and Concentrations (Raw)	Typical Concentration Used	MSDS
Redox / Guar Gum	**Redox**	Guar gum	Increase viscosity and soilds suspension	Guar Gum 100%	1 - 3 kg per 1000 litres of water	Redox Pty Ltd - Material Safety Data Sheet GUGUAR
Xanthum Gum P	**Rheochem**	Corn Based biopolymer (polysaccharide)	Viscosifier	Glyoxal (C2-H2-O2) <1%, Xanthan Gum >60%	2 to 6kg per 1000L	Rheochem Xanthum Gum P MSDS
Defoamer	**AMC**	poly glycol	foam reducing agent	Poly glycol (40-100%), Water (balance)	As per recommendations 0.1% by volume to surface of the fluid.	AMC Defoamer MSDS
Superfoam		Anionic Surfactant	Improves hole cleaning and air assisted fluid removal	Anionic surfactants (>60%), ethylene glycol monobutyl ether (10-30%), other nonhazardous ingredients (balance)	As per recommendations for mist drilling 0.25% - 0.5% by volume. May also use concentrations up to 2.0% similar to foam drilling applications as this is typically added tot eh water stream.	AMC Superfoam MSDS
Portland and Blended Cement	**Cement Australia**	Portland Cement Chemicals 30-100%, Flyash 0-30%	Cement for the casing strings	**Portland Cement:** Portland Cement Clinker <97% Gypsum 4-7% Calcium Oxide 12-16% Magnesium Oxide 0.1-2% **Blended Cement:** Portland Cement 20-95% Gypsum 0-5% Calcium Oxide 0-3% Fly Ash 6-50% Ground granulated blast furnace slag 6-80% Limestone 0-5%	**Portland Cement:** Clinker <97%. Gypsum 4-7%, Calcium Oxide 12-16%, Magnesium Oxide 0.1-2%. **Blended Cement:** Portland Cement 20-95%, Gypsum 0-5%, Calcium Oxide 0-3%, Fly Ash 6-50%, Ground granulated blast furnace slag 6-80%, Limestone 0-5%. Mixes for cement plugs range from 1kg/2.3L to 1kg/0.6L depending on the weight of the cement plug needed to be achieved	Cement Australia - MSDS Portland Cement, Cement Australia - MSDS Blended Cement.
Calcium Chloride	**Redox**	calcium chloride 100%	Enable the cement to set more rapidly	Calcium Cholride 74-100%, water (balance)	2-3%	Redox Pty Ltd - Material Safety Data Sheet CACHLO98
D145A Liquid Dispersant	**Schlumberger**	amine polymer derivative 15-40%, nonhazardous ingredients >60%	Increase pumpability of higher density cements	Amine polymer derivative 15-40%	0.04 gal/sack	D145A-MSDS Schlumberger
AMC or Redox / Potassium Chloride	**AMC or Redox**	Potassium Chloride	Shale and clay stabilisation. Weighting agent	Potasium Chloride 99.0-99.5%, Sodium Chloride 0.5%.	10 - 30 kg per 1000 litres of water	Redox Pty Ltd - Material Safety Data Sheet POCHLA
Hydrochloric Acid	**Redox**	26-32% Hydrochloric acid, Titanium Dioxide 1% max, Water balance	Used to aid well stimulation/cleanup to assit in production	Hydrochloric Acid (28-36%)	Diluted to 10 – 15% by volume.	Redox Pty Ltd - Material Safety Data Sheet HYACID
Sulphamic Acid		99.5-100% Sulphamic acid, Water balance	Used to clean surface equipment and clear downhole obstructions.	99.5-100% Sulphamic acid, Water balance	N/A	Redox Pty Ltd - Material Safety Data Sheet SAUACID

Chemical summaries for chemicals identified in well Workover activities

List of acronyms:

Utilised in evaluation of human health effects:

LD50	Lethal dose required to cause death in 50% of the (non-human) species evaluated (used to evaluate acute toxicity of chemicals)
TDI	Tolerable daily intake
NOAEL	No observed adverse effect level
DWG	Drinking water guideline
pDWG	Preliminary drinking water guideline (calculated where no published value is available)

Utilised in evaluation of environmental effects:

PNEC	Predicted no-effect concentration
EC	Effects concentration, typically expressed as the concentration that results in effects in a percentage of test organisms in a given population under a defined set of conditions. Hence there are the following levels of effects concentrations: EC50 = this is also known as the median effective concentration and is the statistically derived concentration of a substance in an environmental medium expected to produce a certain effect in 50% of test organisms
LC	Lethal concentration, typically expressed as the concentration that results in death of a percentage of test organisms in a given population under a defined set of conditions. LC50 = this is the statistically derived concentration of a substance in an environmental medium expected to produce death in 50% of test organisms

EC50/LC50 are often used in ecotoxicology as an indicator of the toxicity of a compound to the environment.

NOEC	No observed effect concentration (NOEC) – the highest concentration of a compound to which organisms are exposed in a full life-cycle or partial-cycle (short-term) test that causes no observable effects on the test organisms. This is often used to estimate chronic toxicity of chemicals.

In the main report the various ecotoxicological measures available have been more generally referred to as **Tox(eco)** values, which is an abbreviation for toxicity (ecological species) value.

Compound		**Hydrochloric acid**	
Listed on AICS		yes	
NICNAS		Not assessment but is classified under NOHSC	
CAS No.		7647-01-0	M
Molecular Formula		Cl-H	H
Colour/ Form		clear, colourless to slightly yellow fuming liquid	M
Odour/ Taste		sharp pungent and irritating odour	M
Odour Threshold		7 mg/m^3	USEPA
Corrosive		Corrosive to metals	M
Explosive		Will react with most metals to evolve hydrogen gas which when mixed with air may result in fire or explosion if ignited	M
Irritation		Irritating to skin and eyes, respiratory system and mouth, oesophagus and stomach, with potential for severe burns	M
Stability		stable	M
Incompatibility		metals	M
Solubility (mg/L in water (20-25^{o}C)		82.3 g/100g	H
Molecular weight		36.46	H
pH		<1	M
Vapour Pressure (mmHg at 20-25^{o}C)		35424	H
Vapour Density (air = 1)		1.3	M
Henry's Law (atm.m^3/mol at 20-25^{o}C)		4.90E-10	H
Volatility potential	**Soil**	will evaporate	
	Water	low	
Log Kow		NA	
Koc		NA	
Soil Adsorption/ Mobility		dissociates	
Potential for bioaccumulation (BCF)		negligible	H
Degradation potential	**Soil**	rapidly dissociate to chloride and hydronium ions	
	Water	rapidly dissociates to chloride and hydronium ions	
Ranking - Fate and Transport		The compound does not sorb to soil or particles in the water column, is readily and rapidly dissociated and does not bioaccumulate - potential for discharge to receiving body is low	**2**

Compound		**Hydrochloric acid**	
Human Health			
General		Health effects from exposure to hydrochloric acid are principally associated with acute exposures in occupational environments. In addition many of the effects reported are associated with the pH of the acid rather than the effects of the compounds themselves.	OECD
Acute Effects		There are few detailed studies reported for human exposure. The irritation of hydrogen chloride to mucous is so severe that workers evacuate from the work place shortly after detecting its odour. A relation between concentrations from accidental exposure and health effects have not been reported in detail. The acute oral LD50 values were determined to be 238-277 mg/kg bw for female rats, and the inhalation LC50 values were determined to be 23.7-60.9 mg/L/5min, 5.7-7.0 mg/L/30min and 4.2-4.7 mg/L/60min for rats, 20.9 mg/L/5min, 3.9 mg/L/30min and 1.7 mg/L/30min for mice. Hydrogen chloride is corrosive to the skin and severe effects can be expected from exposure to the eyes. No skin sensitisation has been reported.	OECD
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	S
	Peak	7.5	S
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as moderate to high where appropriate PPE is required for the use of this chemical	**3-4**
Chronic Effects		The available data suggests that effects associated with the low pH of the acid is of most significance in relation to long-term effects. Local irritation effects are most common in long term studies. No evidence of carcinogenic effects were reported during oral, dermal or inhalation studies. No reliable studies are available in relation to the assessment of reproductive or developmental toxicity. Protons and chloride ions are normal constituents in the body fluid of animal species, low concentrations of HCl gas/mist or acid solution do not seem to cause effects. In addition the gastric glands secrete HCl acid into the stomach.	OECD
Classifications		International Agency for Research on Cancer (IARC) has classified hydrochloric acid as a group 3 carcinogen - not classifiable	
Guidelines	**Soil**	NA	
	Drinking water	NA	
	RfC	0.02 mg/m^3 (inhalation of mists)	USEPA
Ranking - Chronic Health Impacts		Chronic effects associated with ingestion and dermal contact with this chemical are considered to be low	**2**

	Compound	**Hydrochloric acid**	
	Ecological		
	General	The hazard of hydrochloric acid for the environment is caused by the proton (pH effect). For this reason the effect of hydrochloric acid on the organisms depends on the buffer capacity of the aquatic ecosystem. Also the variation in acute toxicity for aquatic organisms can be explained for a significant extent by the variation in buffer capacity of the test medium. For example, LC50 values of acute fish toxicity tests varied from 4.92 to 282 mg/L. It is not considered useful to calculate a guideline for hydrochloric acid because factors such as the buffer capacity, the natural pH and the fluctuation of the pH are very specific for a certain ecosystem. There is a possibility that the emission of hydrochloric acid could locally decrease the pH in the aquatic environment.	OECD
Aquatic toxicity data (mg/L)	**EC50**	Lowest values of pH 4.4 to 5.3 based on short-term studies with algae, invertebrates and fish	H
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		The potential for ecological effects is considered to be low, however the buffering capacity of the receiving environment may vary and hence the potential for adverse effects is considered to be moderate	**3**

OECD 2002, OECD SIDS Hydrogen Chloride, SIDS Initial Assessment Report, August 2002

USEPA IRIS evaluation of hydrogen chloride

M = data available on MSDS (refer to Appendix B)

H = data available from HSDB (accessed in February 2012)

S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		Guar gum	
MSDS Available		yes	
Listed on AICS		yes	
NICNAS		Not assessed	
CAS No.		9000-30-0	M
Molecular Formula		NA	
Colour/ Form		off-white solid	M
Odour/ Taste		bean odour	M
Odour Threshold		NA	
Corrosive		No	
Explosive		Airborne dust may be explosive	M
Irritation		May cause eye, skin and respiratory irritation. May cause allergic respiratory reaction	M
Stability		stable	M
Incompatibility		strong oxidisers	M
Solubility		forms gel in water	
Solubility (mg/L in water (20-25oC)		forms gel in water	M
Molecular weight		approx 220000	H
pH		6.5 to 7.5	M
Vapour Pressure (mmHg at 20-25oC)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m3/mol at 20-25oC)		NA	
Volatility potential	Soil	no	
	Water	no	
Log Kow		NA	
Koc		NA	
Soil Adsorption/ Mobility		NA	
Potential for bioaccumulation (BCF)		NA	
Degradation potential	Soil	Readily degradable in the environment	
	Water		
Comments		Guar gum is a high molecular weight polysaccharide (sugar complex) extracted from the seeds of the guar plant. It is extensively used as a thickener, stabiliser, suspending agent and binder of free water in many food products including non-alcoholic beverages, frozen dairy desserts, baked goods, gelatine, puddings, meat and meat products, condiments a relishes, breakfast cereals, cheeses, milk products, soups, sweet sauces, gravies, snack foods and processed vegetables. It is also used ion medications, in the paper and textile industries and as a flocculant in mining (including hydraulic fracturing and gelling and waterproofing explosives). As a natural sugar complex, if released into the environment guar gum would be readily dispersed and rapidly biodegraded resulting in no impacts to the aquatic and terrestrial environments.	
Ranking - Fate and Transport		On the basis of the chemical properties of guar gum the potential for discharge to a receiving environment is consider to be negligible	**1**

Compound		**Guar gum**	
Human Health			
General		Guar gum is very poorly absorbed and digested in the human body, is considered non-toxic and hence is used extensively as filler in food products. No adverse effects associated with human exposures to this product have been identified.	
Acute Effects		Acute effects are primarily associated with eye, skin and respiratory irritation.	H
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	STEL	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	**2**
Chronic Effects		Not available	
		Review by Health Canada (2010) considered data from chronic rat and mouse sties that suggested that tetrakis (hydroxymethyl) phosphonium sulphate has carcinogenic potential. In relation to genotoxicity, the number and quality of the available studies is limited and provide mixed results. However the Health Canada (2010) review considered that there was sufficient weight of evidence to consider the product as potentially genotoxic	C
Classifications		IARC has classified tetrakis (hydroxymethyl) phosphonium sulphate as Group 3: not classifiable as to human carcinogenicity due to lack of epidemiological data and inadequate evidence in animals.	
Guidelines	**Soil**	NA	
	Drinking water	NA	
	NOAEL	3.6 mg/kg/day based on bone marrow hypoplasia from a long term study in mice	W,C
	NOAEL	18 mg/kg bw/day based on maternal toxicity derived from a developmental study on rabbits	C
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be negligible	**1**

	Compound	**Guar gum**	
	Ecological		
	General	No data is available in relation to ecological effects of guar gum, however as it is a natural sugar complex that is rapidly degraded in the environment, no adverse effects are relevant to terrestrial and aquatic environments.	
Aquatic toxicity data (mg/L)	**NOEC**	0.67 to 10.4 mg/L based on studies conducted on juvenile Eastern oysters and water fleas, following USEPA guidelines	W
	NOEC	18.1 to 41 mg/L for studies conducted in accordance with USEPA guidance on rainbow trout, bluegill sunfish and marine sheepshead minnow	W
	NOEC	0.72 to 67.4 mg/L	C
	General	Given that tetrakis (hydroxymethyl) phosphonium sulphate is an algaecide and slimicide, it is expected to adversely affect algae (tetrakis (hydroxymethyl) phosphonium sulphate negatively affected biomass of the freshwater green algae at concentrations of 63 µg/L	C
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		On the basis of the available information on the nature of the compound, ecological effects have been determined to be negligible.	**1**

M = data available on MSDS (refer to Appendix B)
H = data available from HSDB (accessed in February 2012)
S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Xanthum Gum**	
Proposed concentration		2 to 6 kg/L	AGL
Listed on AICS		yes	
NICNAS		Not assessed	
CAS No.		11138-66-2	M
Molecular Formula		NA	
Colour/ Form		white powder	M
Odour/ Taste		slight odour	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		Airborne dust may be explosive. Material is considered combustible	M
Irritation		low to moderate eye, skin and respiratory irritant.	M
Stability		stable	M
Incompatibility		oxidising agents and acids	M
Solubility (mg/L in water (20-25oC)		forms gel in water	M
Molecular weight		NA	
pH		NA	
Vapour Pressure (mmHg at 20-25oC)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m3/mol at 20-25oC)		NA	
Volatility potential	**Soil**	no	
	Water	no	
Log Kow		NA	
Koc		NA	
Comments		Xanthum gum is a high molecular weight polysaccharide (sugar complex) derived from the bacterial coat of Xanthomonas campestris. It is extensively used as a thickener and stabiliser in many food products and cosmetics. As a natural sugar complex, if released into the environment the gum would be readily dispersed and rapidly biodegraded resulting in no impacts to the aquatic and terrestrial environments.	
Ranking - Fate and Transport		On the basis of the chemical properties of Xanthum gum the potential for discharge to a receiving environment is considered to be negligible	**1**

Compound		**Xanthum Gum**	
Human Health			
General		Xanthum gum is very poorly absorbed and digested in the human body.	
Acute Effects		Acute effects are primarily associated with eye, skin and respiratory irritation. Considered to be of low acute toxicity, with the acute oral LD50 > 1000 mg/kg.	M
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	STEL	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	**2**
Chronic Effects		Evaluation of Xanthum gum by JECFA indicated no evidence of carcinogenicity or other toxic effects (including reproductive effects). In humans studies indicated no adverse effects at levels up to 10-13 grams daily. Hence the compound is not considered to be toxic and no guidelines have been established.	
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be negligible	**1**
Ecological			
General		No data is available in relation to ecological effects of Xanthum gum, however as it is a natural sugar complex that is rapidly degraded in the environment, no adverse effects are relevant to terrestrial and aquatic environments.	
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		On the basis of the available information on the nature of the compound, ecological effects have been determined to be negligible.	**1**

M = data available on MSDS (refer to Appendix C)
H = data available from HSDB (accessed in February 2012)
S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Polyglycol** **Anionic surfactants**	
Proposed concentration		1% by volume polyglycol, 0.25-0.5% by volume anionic surfactant	AGL
Listed on AICS		yes (polyglycol)	
NICNAS		Not assessed	
CAS No.		NA	H
Colour/ Form		clear straw liquid or clear fluorescent yellow viscous liquid (as used in product)	M
Odour/ Taste		slight odour	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		No	M
Irritation		Polyglycol is a low eye irritant. Anionic surfactants may be skin and eye irritants	M
Stability		stable	M
Incompatibility		None known	M
Solubility (mg/L in water (20-25oC)		Miscible with water	M
Molecular weight		>340	H
Vapour Pressure (mmHg at 20-25oC)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m3/mol at 20-25oC)		NA	
Volatility potential	**Soil**	no	
	Water	no	
Log Kow		NA	
Koc		NA	
Soil Adsorption/ Mobility		Polyglycol is not considered to be highly mobile and anionic surfactants may be mobile depending on the compounds present and dissociation compounds.	H
Potential for bioaccumulation (BCF)		Considered to be low	H
Degradation potential	**Soil**	Readily degradable in the environment	H
	Water		
Ranking - Fate and Transport		On the basis of the chemical properties of these compounds, with high molecular weight, the potential for migration to a receiving environment is considered to be negligible to low	**1-2**

Compound		**Polyglycol Anionic surfactants**	
Human Health			
General		Limited data is available in relation to this compound	
Acute Effects		Acute effects are primarily associated with eye irritation. Considered to be of low acute toxicity, with the acute oral LD50 > 100 mg/kg	M
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	STEL	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	**2**
Chronic Effects		NA, however compounds are considered to be of low toxicity	M
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be negligible	**1**
Ecological			
General		Very limited data is available in relation to ecological effects of these compounds, however it is not considered to toxic to the environment	H, McWilliams and Payne 2001
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		On the basis of the available information on the nature of the compound, ecological effects have been determined to be negligible.	**1**

McWilliams P. and Payne G., 2001. Bioaccumulation Potential of Surfactants: A Review.

M = data available on MSDS (refer to Appendix C)

H = data available from HSDB (accessed in February 2012)

S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Ethylene glycol monobutyl ether [EGBE]**	
Proposed concentration		0.25-0.5% by volume (product) of which 10-30% is this compound	AGL
Listed on AICS		yes	
NICNAS		yes	
CAS No.		111-76-2	H
Molecular Formula		C6H14O2	NICNAS
Colour/ Form		clear fluorescent yellow viscous liquid (as used in product)	M
Odour/ Taste		mild detergent odour (product)	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		No	M
Irritation		eye and skin irritant	M
Stability		stable	M
Incompatibility		None known	M
Solubility (mg/L in water (20-25oC)		Miscible with water	M
Molecular weight		118.2	NICNAS
pH		6 to 8	H
Vapour Pressure (mmHg at 20-25oC)		0.88	NICNAS
Vapour Density (air = 1)		4.91	NICNAS
Henry's Law (atm.m3/mol at 20-25oC)		1.60E-06	H
Volatility potential	**Soil**	low	
	Water	yes	
Log Kow		0.83	H
Koc		67	NICNAS
Soil Adsorption/ Mobility		Will not partition to organic matter and will be highly mobile in the environment.	NICNAS
Potential for bioaccumulation (BCF)		3 - low	H
Degradation potential	**Soil**	Expected to biodegrade rapidly.	H
	Water		
Ranking - Fate and Transport		On the basis of the chemical properties of this compound, it is expected to be highly mobile however it will not persist or bioconcentrate in the environment. Hence the potential for migration to a receiving environment is considered to be low.	**2**

Compound		**Ethylene glycol monobutyl ether [EGBE]**	
Human Health			
General		In general, effects associated with exposure to EGBE have been identified from studies in animals. EGBE has moderate acute toxicity following inhalation, ingestion, or dermal exposure. It is an eye and skin irritant, but it is not a skin sensitiser. The principal effect exerted by EGBE and its metabolite 2-butoxyacetic acid is haematotoxicity. Critical effects observed in inhalation studies were decreased haemoglobin and mean cell haemoglobin; increased haematocrit and mean cell volume. adverse effects on the central nervous system, kidneys and liver occur at higher exposure concentrations than do haemolytic effects.	WHO, NICNAS
Acute Effects		Compound is an eye and skin irritant and considered to be of low to moderate acute toxicity with LD50's in the range 530-3000 mg/kg (oral), 100-610 mg/kg (dermal) and >2200 mg/m3 (inhalation)	NICNAS
Occupational Inhalation Guidelines (mg/m3)	**TWA**	96.9	S
	STEL	242	S
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low to moderate where appropriate PPE is required for the use of this chemical	**2-3**
Chronic Effects		As discussed above	NICNAS
		The compound is not considered to be carcinogenic or genotoxic	OECD
Guidelines	**Soil**	NA	
	Drinking water	NA	
	NOAEL	22.5 mg/kg/day (derived from inhalation NOAEL of 120 mg/m3 for most sensitive effects), consistent with the NOAEL adopted by the OECD and WHO reviews.	NICNAS
	DWHp	0.8 mg/L based on NOEAL and equation in report	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be low to moderate	**2-3**

Compound		**Ethylene glycol monobutyl ether [EGBE]**	
	Ecological		
	General	The available data indicates that this compound is of very low toxicity to fish, aquatic invertebrates, algae and microorganisms and slightly toxic to oysters. LC50 concentrations range from 89.4 mg/L (oysters) to >1000 mg/L	NICNAS, OECD
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		On the basis of the available information on the nature of the compound, ecological effects have been determined to be negligible to low	**1-2**

NICNAS, 1996. Priority Existing Chemical Number 6, 2-butoxyethanol. Full Public Report, October 1996.

OECD, 2004. OECD SIDS Initial Assessment Report Monoethylene Glycol Ethers Category.

WHO, 1998. CICAD 10, 2-Butoxyethanol. Concise International Chemical Assessment Document.

M = data available on MSDS (refer to Appendix C)

H = data available from HSDB (accessed in February 2012)

S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Calcium Chloride**	
Proposed concentration		2-3%	AGL
Listed on AICS		yes	
NICNAS		Not assessed	
CAS No.		10043-52-4	M
Molecular Formula		CaCl2	H
Colour/ Form		white to off-white solid, fine crystals/granular	M
Odour/ Taste		odourless	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		No	M
Irritation		May cause skin, eye and respiratory irritation. May be irritant to mucous membranes.	M
Stability		Stable	M
Incompatibility		methyl vinyl ether, bromine trifluoride, mixture of boron oxide and calcium oxide, water, alkali metals, various metals, zinc and sources of ignition.	M
Solubility (mg/L in water (20-25oC)		7.45E+05	M
Molecular weight		111	M
pH		8-12	M
Vapour Pressure (mmHg at 20-25oC)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m3/mol at 20-25oC)		NA	
Volatility potential	**Soil**	no	
	Water	no	
Soil Adsorption/ Mobility		Due to its high solubility, calcium chloride is highly mobile in the environment.	OECD
Potential for bioaccumulation (BCF)		Low	OECD
Degradation potential	**Soil**	Will dissociate readily to calcium and chloride ions.	OECD
	Water		
Comments		Calcium is an essential nutrient for humans and higher plants and is one of the basic inorganic elements of algae. Calcium plays crucial roles in strengthening cell walls and plant tissues, reducing the toxicity of soluble organic acids, elongating roots, and so on. Chloride is also an essential micronutrient for plants and has important roles in the photosynthesis and osmoregulation.	OECD
Ranking - Fate and Transport		Overall, of released into the environment, calcium chloride is not likely to sorb to solid particles in the water column, is readily dissociated to form chloride and calcium ions, is not bioaccumulative in aquatic species or the food chain	**2**

Compound		**Calcium Chloride**	
Human Health			
General		Calcium chloride is easily dissociated into calcium and chloride ions in water. The absorption, the distribution and the excretion of the ions in animals are regulated separately. Both ions are essential constituents of the body of all animals. Calcium is essential for the formation of skeletons, neural transmission, muscle contraction, coagulation of the blood, and so on. Chloride is required for regulating intracellular osmotic pressure and buffering.	OECD
Acute Effects		The acute oral toxicity is attributed to the severe irritating property of the original substance or its high-concentration solutions to the gastrointestinal tract. In humans, however, acute oral toxicity is rare because large single doses induce nausea and vomiting. Hence the acute toxicity is considered to be low with LD50 (oral) in the range 3798-4179 mg/kg	OECD
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	Peak	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	**2**
Chronic Effects		No significant adverse effects have been identified from repeated dose oral studies with potassium chloride. Gastro-intestinal irritant effects in humans have been reported at doses from about 31 mg/kg bw/day. Both potassium and chloride are essential elements and no guideline has been established for upper level intakes of these compounds.	OECD
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		Chronic effects considered to be negligible	**1**
Ecological			
General		Acute toxicity tests show the lowest LC50 and EC50 concentrations range from 1062 to 4630 mg/L. Chronic toxicity studies show effects concentrations of 320 to 1000 mg/L	OECD
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		Given that calcium is an essential nutrient in the environment, and the low aquatic toxicity of the compound, the potential for adverse ecological effects is considered to be negligible.	**1-2**

OECD, 2002. OECD SIDS Initial Assessment Report for Calcium Chloride, UNEP Publications
M = data available on MSDS (refer to Appendix C)
H = data available from HSDB (accessed in February 2012)
S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Potassium Chloride**	
Proposed concentration		10-30 g/L	AGL
Listed on AICS		yes	
NICNAS		Not assessed	
CAS No.		7447-40-7	M
Molecular Formula		KCl	H
Colour/ Form		White crystals	M
Odour/ Taste		odourless	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		No	M
Irritation		May cause eye irritation	M
Stability		Stable	M
Incompatibility		bromine trifluoride, sulfuric acid and sources of ignition	M
Solubility (mg/L in water (20-25oC)		2.81E+05	M
Molecular weight		74.55	M
pH		7	M
Vapour Pressure (mmHg at 20-25oC)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m3/mol at 20-25oC)		NA	
Volatility potential	**Soil**	no	
	Water	no	
Soil Adsorption/ Mobility		Due to its high solubility, potassium chloride is expected to be mobile in the environment. However this will also be dependant on clay minerals, pH and organic matter as the dissociated ions will sorb (at least partially) under varying conditions.	OECD
Potential for bioaccumulation (BCF)		Low	OECD
Degradation potential	**Soil**	Will dissociate readily to potassium and chloride ions.	OECD
	Water		
Comments		Potassium in plants is important for the osmotic and ionic regulation, plays a key role in the water homeostasis, and is closely connected with processes involved in the protein synthesis. In higher plants, potassium affects photosynthesis at various levels. Cl is also essential for the photosynthesis in plants, and has important functions in the osmotic regulation. An adequate supply of potassium and chloride in plants tends to improve the plant's resistance towards several diseases.	OECD
Ranking - Fate and Transport		Overall, of released into the environment, potassium chloride may (at least partially) sorb to solid particles in the water column, is readily dissociated to form chloride and potassium ions, is not bioaccumulative in aquatic species or the food chain	**1-2**

	Compound	**Potassium Chloride**	
	Human Health		
	General	Potassium chloride is easily dissociated into potassium and chloride ions in water. The absorption, the distribution and the excretion of the ions in animals are regulated separately. Both ions are essential constituents of the body of all animals. Potassium chloride is an essential constituent of the body for intracellular osmotic pressure and buffering, cell permeability, acid-base balance, muscle contraction and nerve function. Chloride is required for regulating intracellular osmotic pressure and buffering.	OECD
	Acute Effects	Acute oral toxicity of KCl in mammals is low (LD50 = 3020 mg/kg bw). In humans, acute oral toxicity is rare because large single doses induce nausea and vomiting, and because KCl is rapidly excreted in the absence of any pre-existing kidney damage.	OECD
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	Peak	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	**2**
	Chronic Effects	No significant adverse effects have been identified from repeated dose oral studies with potassium chloride. Gastro-intestinal irritant effects in humans caused by KCl administrated orally have been reported at doses from about 31 mg/kg bw/day. Both potassium and chloride are essential elements and no guideline has been established for upper level intakes of these compounds.	OECD
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		Chronic effects considered to be negligible	**1**
	Ecological		
	General	Acute toxicity tests show the lowest LC50 and EC50 concentrations range from 120 to 1337 mg/L. Chronic toxicity studies show effects concentrations >100 mg/L. Hence the compound is not considered toxic to aquatic species. The compound is also not considered toxic to terrestrial plants.	OECD
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		Given that the dissociation ions are an essential nutrient in the environment, and the low aquatic and terrestrial toxicity of the compound, the potential for adverse ecological effects is considered to be negligible.	**1**

OECD, 2001. OECD SIDS Initial Assessment Report for Potassium Chloride, UNEP Publications

M = data available on MSDS (refer to Appendix C)

H = data available from HSDB (accessed in February 2012)

S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Sulphamic Acid**	
Proposed concentration		NA	AGL
Listed on AICS		yes	
NICNAS Evaluation		Not assessed but classified by NOHSC	
CAS No.		5329-14-6	M
Molecular Formula		H3NO3S	M
Colour/ Form		white crystals/powder	M
Odour/ Taste		odourless	M
Odour Threshold		NA	
Corrosive		corrosive to metals (note HCL and HsSO4 are considered more corrosive to most metals)	M
Explosive		No	M
Irritation		Corrosive and irritating to skin, eyes and extremely destructive to mucous membranes and upper respiratory tract.	M
Stability		Stable	M
Incompatibility		oxidizing agents, strong bases, chlorine, hypochlorous acid, hypochlorites, cyanides, sulfides, nitrites, nitrates, carbonates, metal oxides, nitric acid, and sources of ignition	M
Solubility (mg/L in water (20-25°C)		2.13E+05	M
Molecular weight		97.1	H
pH		1.18	M
Vapour Pressure (mmHg at 20-25°C)		NA	
Vapour Density (air = 1)		NA	
Henry's Law (atm.m^3/mol at 20-25°C)		NA	
Volatility potential	**Soil**	no	
	Water	no	
Soil Adsorption/ Mobility		Due to high solubility in water the compound is expected to be mobile	
Potential for bioaccumulation (BCF)		Expected to be low	
Degradation potential	**Soil**	As with other inorganic acids this compound is expected to rapidly dissociate in the environment	
	Water		
Ranking - Fate and Transport		The compound does not sorb to soil or particles in the water column, is expected to the readily dissociated in the environment and is not expected to be bioaccumulative - potential for discharge to receiving environment is low	**2**

Compound		**Sulphamic Acid**	
Human Health			
General		Limited data is available in relation to the health effects of exposure to sulphamic acid. Most of the available data relates to acute effects associated with the corrosive and irritation effects to the eyes, skin and respiratory system.	
Acute Effects		Acute effects relate to the corrosive and irritant properties of the chemical. Effects include nausea, vomiting, chemical burns to gastrointestinal tract, irritation and burns to eyes, irritation burns to skin, severe mucous membrane irritation, coughing, choking, headache, dizziness, wheezing, laryngitis, shortness of breath, headache and pulmonary oedema. Acute LC50 is >3000 mg/kg	M
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	STEL	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as moderate where appropriate PPE is required for the use of this chemical	**3**
Chronic Effects		No data is available however review of the use of sulphamic acid in food packaging has not considered that the compound to be of significant toxicity at low concentrations as it is expected to be largely unmetabolised and excreted unchanged.	
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		Chronic effects considered to be negligible	**1**
Ecological			
General		The most significant issue in relation to discharge of sulphamic acid to an environment is the impact of pH on the receiving environment. This will depend on the buffering capacity of the environment.	
Aquatic toxicity data (mg/L)	**LC50**	14.3 to 84 mg/L for fish species	US
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		The potential for ecological effects is considered to be low, however the buffering capacity of the receiving environment may vary and hence the potential for adverse effects is considered to be moderate	**3**

OECD 2000, Citric Acid. SIDS Initial Assessment Report, UNEP November 2000.
M = data available on MSDS (refer to Appendix C)
H = data available from HSDB (accessed in February 2012)
S = occupational guidelines available from Safework Australia (retrieved February 2012)

Compound		**Amine polymer derivative**	
Proposed concentration		NA	AGL
Listed on AICS		yes	
NICNAS Evaluation		Not assessed but classified by NOHSC	
CAS No.		NA	M
Molecular Formula		NA	M
Colour/ Form		clear to hazy yellow liquid	M
Odour/ Taste		faint formaldehyde odour	M
Odour Threshold		NA	
Corrosive		No	M
Explosive		No	M
Irritation		May cause skin sensitisation	M
Stability		Stable	M
Incompatibility		oxidising agents	M
Solubility (mg/L in water (20-25^{o}C)		soluble in water	M
Molecular weight		NA	
pH		9-12	M
Volatility potential	**Soil**	no	
	Water	no	
Soil Adsorption/ Mobility		Expected to partition to soil/sediment, hence have low mobility	US
Potential for bioaccumulation (BCF)		Expected to be low	M
Degradation potential	**Soil**	Low potential for degradation.	M, US
	Water		
Ranking - Fate and Transport		Compound is expected to sorb to soil/sediment and not be mobile.	**2**

Compound		**Amine polymer derivative**	
Human Health			
General		In general poly amine compounds are not considered to be toxic to humans (in relation to oral or dermal toxicity including reproductive and developmental effects). However the MSDS provided for this compound suggests the potential for formaldehyde to be present. Formaldehyde is carcinogenic to humans.	
Acute Effects		Low acute toxicity based on the available information on amine polymers in general	M
Occupational Inhalation Guidelines (mg/m3)	**TWA**	NA	
	STEL	NA	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as negligible to low where appropriate PPE is required for the use of this chemical	**1-2**
Chronic Effects		As noted above. Main issue relates to the potential presence of formaldehyde which is carcinogenic, however the fraction of formaldehyde present in the product is expected to be low.	
Guidelines	**Soil**	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		Chronic effects considered to be low as the only significant risk issue is identified for an impurity	**2**
Ecological			
General		Limited data is available. The MSDS suggests an EC50 of 60-100 mg/L for algae indicating a moderate level of toxicity.	
Guidelines	**Fresh water**	NA	
	Marine water	NA	
Ranking - Ecological Impacts		The potential for ecological effects is considered to be moderate, however this is based on very limited data	**3**

US 2006. Final Submission for Succinimide Dispersants, HPV Challenge Program. Prepared by the America Chemistry Council

M = data available on MSDS (refer to Appendix C)

H = data available from HSDB (accessed in February 2012)

S = occupational guidelines available from Safework Australia (retrieved February 2012)

Appendix B MSDS for Chemicals used on Well Workover Activities

AMC Defoamer MSDS

AMC Superfoam MSDS

Blend Cement Cement Australia

Calcium Chloride Redox

Guar Gum Redox

Hydrochloric Acid 28-36% Redox

Low-Temperature Liquid Dispersant D145A

Portland Cement Cement Australia

Redox Pty Ltd - Material Safety Data Sheet POCHLA

Redox Sulphamic Acid MSDS

Xanthum Gum P (Xanvis) Rheochem

an imdex limited company

AMC Defoamer

Hazard Alert Code: NIL

Chemwatch Material Safety Data Sheet
Issue Date: 1-Sep-2009
XC9317TC

CHEMWATCH 7176-51
Version No:3

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
AMC Defoamer

PRODUCT USE
For use in drilling applications, for the prevention of foaming.

SUPPLIER
Company: AMC
Address:
5 Pitino Court
Osborne Park
WA, 6017
Australia
Telephone: +61 8 9445 4000
Emergency Tel:**+61 400 966 951**
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to NOHSC Criteria, and ADG Code.

CHEMWATCH HAZARD RATINGS

Flammability	🟦				
Toxicity	🟦				
Body Contact	🟦				
Reactivity	🟦				
Chronic	🟦				
SCALE:	Min/Nil=0	Low=1	Moderate=2	High=3	Extreme=4

RISK
•None under normal operating conditions.

SAFETY
•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
poly glycol		40-100
water	7732-18-5	balance

continued...

Section 4 - FIRST AID MEASURES

SWALLOWED
- 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.

EYE
■ If this product comes in contact with the eyes:
- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN
■ If skin or hair contact occurs:
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED
- If fumes, aerosols or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN
■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

FIRE FIGHTING
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.

FIRE/EXPLOSION HAZARD
- Non combustible.
- Not considered a significant fire risk, however containers may burn.

FIRE INCOMPATIBILITY
■ None known.

HAZCHEM
None

PERSONAL PROTECTION

Glasses:	Gloves:
Chemical goggles.	When handling larger quantities:

continued...

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.

MAJOR SPILLS

■ Minor hazard.

- Clear area of personnel.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact by using protective equipment as required.
- Prevent spillage from entering drains or water ways.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

■ None known.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

• water:	CAS:7732- 18- 5

PERSONAL PROTECTION

EYE

- Safety glasses with side shields
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a

continued...

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. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].

HANDS/FEET

■ Wear general protective gloves, eg. light weight rubber gloves.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity.

OTHER

■ No special equipment needed when handling small quantities.
OTHERWISE:

- Overalls.
- Barrier cream.
- Eyewash unit.

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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Clear straw liquid with a slight odour; mixes with water.

PHYSICAL PROPERTIES

Liquid.
Mixes with water.

State	Liquid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Available
Boiling Range (°C)	130	Solubility in water (g/L)	Miscible
Flash Point (°C)	Not Applicable	pH (1% solution)	Not Available
Decomposition Temp (°C)	Not Available	pH (as supplied)	6.0- 8.0
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	1.05
Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

Section 10 - STABILITY AND REACTIVITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

For incompatible materials - refer to Section 7 - Handling and Storage.

continued...

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS
- Generally not applicable.

CHRONIC HEALTH EFFECTS
- Generally not applicable.

TOXICITY AND IRRITATION

AMC DEFOAMER:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (Rat) LD50: >100 mg/kg	

WATER:

■ No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

No data

May be harmful to fauna if not disposed of according to Section 13 and legislative requirements. [AMC]

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
AMC Defoamer	No Data Available	No Data Available		

Section 13 - DISPOSAL CONSIDERATIONS

■ Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area.

A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction.
- 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.
- Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:

None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: UN, IATA, IMDG

continued...

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE None

REGULATIONS

Regulations for ingredients

water (CAS: 7732-18-5) is found on the following regulatory lists;
"Australia Inventory of Chemical Substances (AICS)","IMO IBC Code Chapter 18: List of products to which the Code does not apply", "International Fragrance Association (IFRA) Survey: Transparency List"

No data for AMC Defoamer (CW: 7176-51)

Section 16 - 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.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)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.

Issue Date: 1-Sep-2009
Print Date: 28-Jul-2011

This is the end of the MSDS.

an imdex limited company

AMC Superfoam

Hazard Alert Code: NIL

Chemwatch Material Safety Data Sheet
Issue Date: 15-Apr-2011
XC9317TC

CHEMWATCH 6503-82
Version No:6
CD 2011/2 Page 1 of 7

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
AMC Superfoam

PRODUCT USE
Drilling foaming agent.

SUPPLIER
Company: AMC
Address:
5 Pitino Court
Osborne Park
WA, 6017
Australia
Telephone: +61 8 9445 4000
Emergency Tel:**+61 400 966 951**
Fax: +61 8 9445 4040

Company: AMC
Address:
PO Box 1141
Osborne Park
WA, 6916
Australia
Telephone: +61 8 9445 4000
Emergency Tel:**+61 400 966 951**
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to NOHSC Criteria, and ADG Code.

CHEMWATCH HAZARD RATINGS

Flammability	■				
Toxicity	■				
Body Contact	■				
Reactivity	■				
Chronic	■				
SCALE:	Min/Nil=0	Low=1	Moderate=2	High=3	Extreme=4

RISK
•None under normal operating conditions.

SAFETY
•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
anionic surfactants		>60
ethylene glycol monobutyl ether	111-76-2	10-30
other nonhazardous ingredients		balance

continued...

Section 4 - FIRST AID MEASURES

SWALLOWED

- 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.

EYE

■ If this product comes in contact with the eyes:
- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin or hair contact occurs:
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If fumes, aerosols or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN

■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

FIRE FIGHTING

- Use water delivered as a fine spray to control fire and cool adjacent 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.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered a significant fire risk, however containers may burn.

FIRE INCOMPATIBILITY

■ None known.

HAZCHEM

None

PERSONAL PROTECTION

Glasses:	Gloves:	Respirator:
Chemical goggles.	1.SARANEX- 2.PE/EVAL/PE	Type A Filter of sufficient capacity

continued...

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact by using protective equipment.
- Prevent spillage from entering drains, sewers or water courses.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

■ Avoid contamination of water, foodstuffs, feed or seed.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m	STEL ppm	STEL mg/m	Peak ppm	Peak mg/m	TWA F/CC	Notes
Australia Exposure Standards	ethylene glycol monobutyl ether (2-Butoxyethanol)	20	96.9	50	242				Sk

PERSONAL PROTECTION



continued...

RESPIRATOR

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

EYE

- Safety glasses with side shields
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens 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. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].

HANDS/FEET

■ Wear general protective gloves, eg. light weight rubber gloves.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity.

OTHER

■ No special equipment needed when handling small quantities.
OTHERWISE:
- Overalls.
- Barrier cream.
- Eyewash unit.

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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Clear fluorescent yellow viscous liquid with a mild detergent odour; mixes with water.

PHYSICAL PROPERTIES

Liquid.
Mixes with water.

State	Liquid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Available
Boiling Range (°C)	100	Solubility in water (g/L)	Miscible
Flash Point (°C)	Not Applicable	pH (1% solution)	Not Available
Decomposition Temp (°C)	Not Available	pH (as supplied)	7.5
Autoignition Temp (°C)	Not Applicable	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	1.01
Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

ethylene glycol monobutyl ether

log Kow (Prager 1995):	0.83
log Kow (Sangster 1997):	0.8

continued...

Section 10 - STABILITY AND REACTIVITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

- Generally not applicable.

CHRONIC HEALTH EFFECTS

- Generally not applicable.

TOXICITY AND IRRITATION

AMC SUPERFOAM:

■ Not available. Refer to individual constituents.

ETHYLENE GLYCOL MONOBUTYL ETHER:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 470 mg/kg	Skin (rabbit): 500 mg, open; Mild
Dermal (rabbit) LD50: 220 mg/kg	Eye (rabbit): 100 mg/24h- Moderate
Inhalation (human) TCLo: 100 ppm	Eye (rabbit): 100 mg SEVERE
Inhalation (human) TCLo: 195 ppm/8h [Union Carbide]	
Inhalation (Rat) LC50: 450 ppm	

■ The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis.
For ethylene glycol:
Ethylene glycol is quickly and extensively absorbed through the gastrointestinal tract. Limited information suggests that it is also absorbed through the respiratory tract; dermal absorption is apparently slow.
For ethylene glycol monoalkyl ethers and their acetates (EGMAEs):
Typical members of this category are ethylene glycol propylene ether (EGPE), ethylene glycol butyl ether (EGBE) and ethylene glycol hexyl ether (EGHE) and their acetates.
EGMAEs are substrates for alcohol dehydrogenase isozyme ADH-3, which catalyzes the conversion of their terminal alcohols to aldehydes (which are transient metabolites).
Acute Toxicity: Oral LD50 values in rats for all category members range from 739 (EGHE) to 3089 mg/kg bw (EGPE), with values increasing with decreasing molecular weight.
Exposure of pregnant rats to ethylene glycol monobutyl ether (2-butoxyethanol) at 100 ppm or rabbits at 200 ppm during organogenesis resulted in maternal toxicity and embryotoxicity including a decreased number of viable implantations per litter. Slight foetoxicity in the form of poorly ossified or unossified skeletal elements was also apparent in rats.
At least one researcher has stated that the reproductive effects were less than that of other monoalkyl ethers of ethylene glycol.
NOTE: Changes in kidney, liver, spleen and lungs are observed in animals exposed to high concentrations of this substance by all routes.

CARCINOGEN

2- Butoxyethanol	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3

SKIN

ethylene glycol monobutyl ether	Australia Exposure Standards - Skin	Notes	Sk

continued...

Section 12 - ECOLOGICAL INFORMATION

No data
May be harmful to fauna if not disposed of according to Section 13 and legislative requirements. [AMC]

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
AMC Superfoam	No Data Available	No Data Available		
ethylene glycol monobutyl ether	LOW	LOW	LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

■ Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area.
A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction.
- 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.
- Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:
None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: UN, IATA, IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE None

REGULATIONS

Regulations for ingredients

ethylene glycol monobutyl ether (CAS: 111-76-2) is found on the following regulatory lists;
"Australia Exposure Standards","Australia Hazardous Substances","Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)","IMO MARPOL 73/78 (Annex II) - List of Other Liquid Substances", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Fragrance Association (IFRA) Survey: Transparency List"

No data for AMC Superfoam (CW: 6503-82)

continued...

Section 16 - 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.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)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.

Issue Date: 15-Apr-2011
Print Date: 28-Jul-2011

This is the end of the MSDS.

Material Safety Data Sheet (MSDS)

MSDS No. CA 002

Blended Cement

Section 1: Identification of the Material and Supplier

Company Details:

Cement Australia Pty Limited

ABN 75 104 053 474
12 Station Avenue
Darra
Queensland 4075

Tel: 1300 CEMENT (1300 236 368)
Fax: 1800 CEMENT (1800 236 368)
Website: www.cementaustralia.com.au

Manufacturing Plants

Newcastle:	Highgate Street, Auburn NSW 2144
Gladstone:	Landing Rd, Fisherman's Landing, Gladstone QLD 4680
Brisbane:	77 Pamela St, Pinkenba QLD 4008
Kandos:	Jamieson St, Kandos NSW 2848
Railton:	Cement Works Rd, Railton, TAS 7305

Terminals

Glebe:	Sommerville Rd, Glebe Island, NSW 2037
Clyde:	Highgate St. Auburn, NSW 2144
Melbourne:	Currajong St. West Footscray, VIC 3012
Townsville	Benwell Rd, Townsville Port Townsville QLD 4810

Product: Blended Cement

Other Names:

- General Purpose Blended Cement
- Low Heat Cement
- Shrinkage Limited (SL)
- Sulphate Resisting Cement – Slag
- Q Cement
- Sulphate Resisting Cement
- Sulphate Resisting Cement – Fly Ash

Use: Blended Cement is used as a binder in concrete, concrete masonry, mortar and grouts. It is also used in the manufacture of fibre cement products, in soil stabilisation in building construction and civil engineering projects.

Section 2: Hazards Identification

Hazardous Substance. Non-dangerous Goods

Risk Phrases	Safety Phrases
R20/21/22: Harmful by inhalation, in contact with skin and if swallowed.	**S22:** Do not breathe dust.
R36/37/38: Irritating to eyes, respiratory system and skin.	**S24/25:** Avoid contact with skin and eyes.
R43: May cause sensitisation by skin contact.	**S29:** Do not empty into drains.
R66: Repeated exposure may cause skin dryness or cracking.	**S36/37/39:** Wear suitable protective clothing, gloves and eye/face protection.
R48/20: Danger of serious damage to health by prolonged exposure through inhalation.	**S38:** In case of insufficient ventilation, wear suitable respiratory equipment.

Section 3: Composition/Information on Ingredients

Blended Cement consists of a crystalline mass manufactured from substances mined from the earth's crust. It contains trace amounts of naturally occurring, but potentially hazardous chemical entities including metals such as chromium and nickel and crystalline silica. It also contains added supplementary cementitious material (fly ash or ground granulated slag). All significant constituents are listed below:

Chemical Entity	Proportion	CAS Number
Portland Cement Clinker	20-95%	65997-15-1
Gypsum	0-5%	10101-41-4
Calcium Oxide	0-3%	1305-78-8
Fly ash (Where applicable)	8 - 50%	69131-74-8
Ground Granulated Blast Furnace slag (where applicable)	8 - 80%	65999-69-2
Limestone ($CaCO^3$)	0 - 5%	1317-65-3
Hexavalent Chrome Cr (VI) (Cement)	<20 ppm	1333-82-0
Crystalline Silica (Quartz)	<1-10%	14808-60-7

Section 4: First Aid Measures

Swallowed:	Rinse mouth and lips with water. Do not induce vomiting. Give water to drink to dilute stomach contents. If symptoms persist, seek medical attention.
Eyes:	Flush thoroughly with flowing water for 15 minutes to remove all traces. If symptoms such as irritation or redness persist, seek medical attention. If wet cement is splashed in the eye, always treat as above, and seek urgent medical attention.
Skin:	Remove heavily contaminated clothing immediately. Wash off skin thoroughly with water. Use a mild soap if available. Shower if necessary. Seek medical attention for persistent irritation or burning of the skin.
Inhaled:	Remove to fresh air, away from dusty area. If symptoms persist, seek medical attention.
First Aid Facilities:	Eye wash station. Washing facilities with running water.
Advice to Doctor:	Treat symptomatically. Wet cement burns to skin or eye may result in corrosive caustic burns. Ingestion of significant amounts of cement dry or wet is unlikely. Do not induce emesis or perform gastric lavage. Neutralisation with acidic agents is not advised because of increased risks of exothermic burns. Water-mineral oil soaks may aid in removing hardened cement from the skin. Ophthalmological opinion should be sought for ocular burns.

Section 5: Fire Fighting Measures

Fire/Explosion Hazard:	Blended Cements are stable substances, compatible with most other building materials, will not decompose into hazardous by-products and do not polymerise.
Hazchem Code:	None allocated
Flammability:	Not flammable
Extinguishing Media:	None required
Hazards from Combustion Products:	None
Special Protective Precautions and equipment for fire fighters:	None required

Section 6: Accidental Release Measures

Spills:	Spills are best cleaned up by vacuum device to avoid generating airborne dust. Recommendations on Exposure Control and Personal Protection should be followed during spill clean-up. Keep product out of storm water and sewer drains. Wetting during clean-up will cause formation of setting cement.

Section 7: Handling and Storage

Handling:	When supplied in bags these need to be handled in accordance with manual handling Regulations and Code of Practice.
Storage:	Protect from moisture to prevent hardening. Storage of cement may be in concrete silos, steel bins, or plastic lined multi-ply paper bags.

Section 8: Exposure Controls/Personal Protection

Exposure Limits:	National Occupational Health & Safety Commission (NOHSC) Australia Occupational Exposure Standard: Exposure to dust should be kept as low as practicable, and below the following OES. Portland Cement: 10mg/m^3 TWA (time-weighted average) as inspirable dust. Crystalline silica (quartz): 0.1 mg/m^3 TWA as respirable dust (≤7 microns particle equivalent aerodynamic diameter). Chromium VI (hexavalent): 0.05 mg/m^3 sensitiser.
Engineering Controls:	All work with dry cement should be carried out in such a way as to minimise dust generation, exposure to dust and repeated or extended skin contact. When handling dry cement, use local mechanical ventilation or extraction in areas where dust could escape into the work environment. For bulk deliveries, closed pumping systems are recommended. For handling of individual bags, follow instructions below if no local exhaust ventilation is available. Local dust extraction and collection may be used, if necessary, to control airborne dust levels. Work methods and engineering should aim to minimise contact with wet cement onto exposed skin. Work areas should be cleaned regularly.
Personal Protection: Skin:	Minimise contact with Portland Cement materials. When handling dry or wet cement, wet concrete, mortar or grout, personnel should wear protective clothing and impervious footwear, and gloves such as PVC (see Australian and New Zealand Standards AS/NZS 4501 and AS 2161). Never kneel in wet cement, or allow extended contact of skin with wet cement. Remove clothing that has become contaminated with wet or dry cement to avoid prolonged contact with the skin. If cement gets into boots, remove socks and boots immediately and wash skin thoroughly. Wash work clothes regularly. To avoid contamination of face and lips and ingestion, wash hands before eating or smoking.
Eyes	Splash resistant Safety Glasses with side shields or safety goggles (AS/NZ 1336) or a face shield should be worn to ensure all contact with eyes is avoided.

Section 8: Exposure Controls/Personal Protection (Cont'd)

Personal Protection:	Respiratory
	Where engineering and handling controls are not adequate to minimise exposure to total dust and to respirable crystalline silica wear a suitable P1 or P2 particulate respirator (AS/NZS 1715 and AS/NZS 1716). Use only respirators that bear the Australian Standards mark and are fitted and maintained correctly. For dust levels approaching or exceeding the NES (see above) a more effective particulate respirator as described in AS/NZS 1715 should be worn. Procedures for effective use of respirators should be applied and supervised.

Section 9: Physical and Chemical Properties

Appearance (dry):	A fine powder ranging in colour from grey to off-white
Odour:	No distinctive odour
Boiling/Melting Point:	Melting point >1200°C
Vapour Pressure:	Not applicable
Specific Gravity:	2.7 – 3.2
Flash Point:	Non applicable
Flammability Limits:	Not applicable
Solubility In Water:	Slight, reacts on mixing with water forming an alkaline (caustic) solution (pH >11)
Particle Size:	Up to 40% of the fresh dry material may be respirable (below 10 microns)

Section 10: Stability and Reactivity

Blended Cements are stable substances, compatible with most other building materials, will not decompose into hazardous by-products and do not polymerise.

Chemical Stability:	Chemically stable
Conditions to Avoid:	Keep free of moisture during storage
Incompatible Materials:	None
Hazardous Decomposition Products:	None
Hazardous Reactions:	None

Section 11: Toxicological Information

There is no direct toxicological data on Portland Cements. Health effects information is based on reported effects in use from overseas and Australian reports.

Short Term (Acute) Exposure

Swallowed:	Unlikely under normal industrial use. Mildly abrasive and corrosive to mouth and throat if swallowed. May cause nausea, stomach cramps and constipation.
Eyes:	Irritating and corrosive to the eyes and may cause alkaline burns. Cement dust is irritating to the eyes. Exposure to dust may aggravate existing eye irritations.
Skin:	Dust is irritating and drying to the skin. Direct contact with wet cement may cause serious skin burns. Within 12 to 48 hours (after one- to six-hour exposures) possible first, second or third degree burns may occur. There may be no obvious pain at the time of the exposure. Chronic skin disorders may be aggravated by exposure to dust or contact with wet cement.

Section 11: Toxicological Information (Cont'd)

Short Term (Acute) Exposure

Inhaled:	Cement dust is irritating to the nose, throat and respiratory tract causing coughing and sneezing. Pre-existing upper respiratory and lung diseases including asthma and bronchitis may be aggravated.

Long Term (Chronic) Exposure

Eyes:	Dust may cause irritation and inflammation of the cornea.
Skin:	Repeated contact causes irritation and drying of the skin and can result in skin reddening and skin rash (dermatitis). Over time this may become chronic and can also become infected. Persons who are allergic to chromium may develop an allergic dermatitis which aggravates the irritant effects and this combination can lead to chronic cement dermatitis and serious disability particularly affecting the hands.
Inhaled:	Repeated exposure to the dust may result in increased nasal and respiratory secretions and coughing. Inflammation of lining tissue of the respiratory system may follow repeated exposure to high levels of dust, with increased risk of bronchitis and pneumonia. Repeated and prolonged exposure to dust levels which exceed the OES for crystalline silica (see above) may occur. This can cause bronchitis, and silicosis (scarring of the lung). Long term overexposure to respirable crystalline silica dust may increase the risk of other irreversible and serious disorders including scleroderma (a disease affecting the connective tissue of the skin, joints, blood vessels and internal organs). Cement (Portland Cement) is not classified as a carcinogen by NOHSC. Of the ingredients Hexavalent Chromium (Cr VI) is classified as a carcinogen by NOHSC. There is debate in the medical literature concerning whether there is any risk of lung cancer arising from long term high overexposure to respirable crystalline silica. Risk of lung cancer has not been identified from using Portland Cements containing silica. The International Agency for Research on Cancer (IARC) has classified crystalline silica, inhaled in the form of quartz or cristobalite from occupational sources, as carcinogenic to humans (Group 1). NOHSC has not classified crystalline silica as a carcinogen.

Section 12: Ecological Information

Ecotoxicity:	Product forms an alkaline slurry when mixed with water.
Persistence and Degradability:	Product is persistent and would have a low degradability.
Mobility:	A low mobility would be expected in a landfill situation.

Section 13: Disposal Considerations

Blended Cement can be treated as a common waste for disposal or dumped into a landfill site in accordance with local authority guidelines.

Keep material out of storm water and sewer drains.

Measures should be taken to prevent dust generation during disposal, and exposure and personal precautions should be observed (see above).

Section 14: Transport Information

Transportation is done in bulk or bag form by Ship, Rail and Road.

UN Number:	None allocated
Proper Shipping Name:	None allocated
Class and Subsidiary Risk:	None allocated
Packing Group:	None allocated
Special precautions for user:	Avoid generating and breathing dust
Hazchem Code:	None allocated

Section 15: Regulatory Information

Blended Cement is not classified as Dangerous Goods.
Classified as Hazardous according to the criteria of the National Occupational Health and Safety Commission (NOHSC) Approved Criteria For Classifying Hazardous Substances [NOHSC: 1008] 3rd Edition

Exposures by inhalation to high levels of dust may be regulated under the Hazardous Substances Regulations (State) as they are applicable to Respirable Crystalline Silica, requiring exposure assessment, controls and health surveillance (NOHSC).

Section 16: Other Information

For further information on this product contact:	Telephone: (07) 3375 0501 (Business Hours) Facsimile: (07) 3375 0473 Contact Person: Technical Manager
Emergency Contact Number:	Telephone: (07) 3375 0501 (Business Hours) or Poisons Information Centre 13 11 26

Next Review Date for this MSDS: 31 December 2016.

Australian and New Zealand Standards:

AS 2161: Industrial Safety Gloves and Mittens (excluding electrical and medical gloves).
AS/NZ 1336: Recommended Practices for Occupational Eye Protection.
AS/NZS 1715: Selection, use and maintenance of respiratory protective devices.
AS/NZS 1716: Respiratory protective devices.
AS/NZS 4501: Occupational protective clothing.

Advice Note:

Cement Australia believes the information in this document to be accurate as at the date of preparation noted below, but, to the maximum extent permitted by law, Cement Australia accepts no responsibility for any loss or damage caused by any person acting or refraining from action because of this information.

The provision of this information should not be construed by anyone as a recommendation to use this product. In particular, no one should use any product in violation of any patent or other intellectual proprietary rights or in breach of any statute or regulation.

Users should rely on their own knowledge and inquiries and make their own determination as to the applicability of this information in relation to their particular purposes and specific circumstances. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace and in conjunction with other substances or products.

This MSDS must be reviewed before 31 December 2016.

MATERIAL SAFETY DATA SHEET - CACHLO98

1. IDENTIFICATION

Revision Date	SEPTEMBER 2008
Product Name	CALCIUM CHLORIDE ANHYDROUS
Other Names	CALCIUM CHLORIDE SOLID; CALCIUM CHLORIDE ANHYDROUS; OR CALCIUM CHLORIDE DIHYDRATE.
Uses	De-icing and dust control of roads, drilling muds, dustproofing, freeze proofing and thawing coal, coke, stone, sand, ore, concrete conditioning, paper and pulp industry, fungicides, refrigeration brines, drying and desiccating agent, sequestrant in foods, firming agent in tomato canning, tire weighting, pharmaceuticals, electrolytic cells.

Contact Information

Organisation	Location	Telephone	Ask For
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61 2 97333000	Technical Officer
	11 Mayo Road Wiri Auckland 2104 New Zealand	+64 9 2506222	
Poison Information Centre	Westmead NSW Australia	131126	
Chemcall 24 Hour Emergency Number	Australia	1800-127406	
	New Zealand	0800-243622	
National Poisons Centre	New Zealand	0800-764766	

2. HAZARD IDENTIFICATION

Hazardous according to criteria of NOHSC/ASCC.

IRRITANT

Risk Phrases	R36 Irritating to eyes.
Safety Phrases	S22 Do not breathe dust.

S24 Avoid contact with skin.

ERMA New Zealand Approval Code	HSR003389
HSNO Hazard Classification	6.1D 6.3A 6.4A 9.3C

This Material Safety Data Sheet may not provide exhaustive guidance for all HSNO Controls assigned to this substance. The ERMA Web Site should be consulted for a full list of triggered controls and cited regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	Chemical Entity	CAS Number	Proportions (%)
	CALCIUM CHLORIDE	[10043-52-4]	74.0-100.0
	WATER	[7732-18-5]	BALANCE

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure.

Swallowed	Rinse mouth with water. Give water to drink. Do NOT induce vomiting. If vomtiting occurs, give further water. Seek medical advice immediately.
Eye	If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing untill advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
Skin	If skin contact occurs, remove any contaminated clothing and wash skin with running water. If irritation occurs, seek medical advice.
Inhaled	Remove victim from exposure to fresh air - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm and at rest until fully recovered. Seek medical advice if effects persist.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient.
Aggravated medical conditions caused by exposure	No information available on medical conditions aggravated by exposure to this product. To the best of our knowledge, the acute and chronic toxicity of this substance is not fully known. The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this product. No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA, or ACGIH. Prolonged or repeated skin contact may lead to allergic contact dermatitis in some individuals. The skin may react by producing redness, irritation, weals or pustules.

5. FIRE FIGHTING MEASURES

Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions. Suitable media may include fine water spray, normal foam, or dry agent such as carbon dioxide or dry chemical powder.

	Keep containers cool with water spray. Do NOT use water directly on material.
Hazards from Combustion Products	Non-combustible solid. Negligible fire hazard when exposed to heat or flame. This product does not burn. Incompatible with methyl vinyl ether, bromine trifluoride, mixture of boron oxide and calcium oxide, water, akali metals, various metals, zinc and sources of ignition. When involved in a fire, this product may generate toxic fumes, including chlorine, oxides of calcium, and hydrogen chloride.
Special Protective Precautions and Equipment for Fire Fighters	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves). Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment. Avoid breathing corrosive vapours; keep upwind. Dike area to prevent runoff and contamination of water sources.
Flammability Conditions	Product is a non-flammable solid.
Additional Information	
Hazchem Code	N/A

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures	Avoid accidents, clean up immediately. spillage of product creates slippery surfaces. Personnel involved in the clean up should wear full protective clothing. Evacuate all unnecessary personnel. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger area. Do NOT let product reach drains or waterways. If the product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management.
Methods and Materials for Containment and Clean Up	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled container and dispose of promptly as hazardous waste. Wash area down with excess water.

7. HANDLING AND STORAGE

Precautions for Safe Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid handling which leads to dust formation. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes. This product is hygroscopic and emitts heat when dissolved in water. Instantly remove any soiled and impregnated garments. Launder contaminated clothing before re-use. Keep away from moisture and incompatible materials.
Conditions for Safe Storage (Including Any Incompatibles)	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Protect from direct sunlight and moisture.

	Prevent formation of dust. The product is hygroscopic and emits heat when dissolved in water. Keep away from foodstuffs, beverages and food. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container Type	Packaging must comply with requirements of Hazardous Substances (Packaging) Regulations 2001. Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These 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 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.
Biological Limit Values	No information available on biological limits for this product.
Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. ADDITIONAL INFORMATION ABOUT DESIGN OF TECHNICAL SYSTEMS: Properly operating chemical fume hood designed for hazardous chemicals and having a face velocity of at least 100 feet per minute.
Personal Protection	RESPIRATOR: Wear an effective dust mask (P2 filter) where dusts are generated and engineering controls are inadequate (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: PVC or neoprene gloves (AS2161). Do NOT use leather or cotton. CLOTHING: Chemical-resistant coveralls and safety footwear (AS3765/2210). Do NOT use leather boots/products as they will dehydrate resulting in shrinkage and possible destruction.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	White to Off White Solid; Granular; Fine Crystals; Flakes; or Powder.
Formula	$CaCl_2$ (or) $CaCl_2.2H_2O$
Odour	Odourless
Vapour Pressure	Insignificant mm Hg (1 atmosphere)
Vapour Density	Not applicable.
Boiling Point	>1600'C deg C
Melting Point	772-782'C deg C
Solubility in Water	745g/L (20'C)
Specific Gravity	2.15g/cm3 (Water = 1)
Flash Point	

	Not applicable.
pH	8-12 (10% H_2O solution)
Lower Explosion Limit	Not applicable.
Upper Explosion Limit	Not applicable.
Ignition Temperature	Not applicable.
Specific Heat Value	Not applicable.
Particle Size	Not applicable.
Volatile Organic Compounds (VOC) Content	Not applicable.
Evaporation Rate	Not applicable.
Viscosity	Not applicable.
Percent Volatile	Not applicable.
Octanol/Water partition coefficient	Not applicable.
Saturated Vapour Concentration	Not applicable.
Additional Characteristics	Not applicable.
Flame Propagation/Burning Rate of Solid Materials	Not applicable.
Properties of Materials That May Initiate or Contribute to Fire Intensity	Not applicable.
Potential for Dust Explosion	Product is not explosive.
Reactions that Release Flammable Gases	Not applicable.
Fast of Intensely Burning Characteristics	Not applicable.
Non-flammables That Could Contribute Unusual Hazards to a Fire	Not applicable.
Release of Invisible Flammable Vapours and Gases	Not applicable.

Decomposition Temperature	Not applicable.
Additional Information	Molecular Weight: 111.0g/mol Bulk Density: 0.75-1.0g/cm3 Solubility: Soluble in water, alcohol, acetic acid and acetone.

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature. Hygroscopic. Absorbs moisture from the surrounding air.
Conditions to Avoid	Avoid excessive heat, generating dust, direct sunlight, moisture, static charges and high temperatures.
Incompatible Materials	Incompatible with methyl vinyl ether, bromine trifluoride, mixture of boron oxide and calcium oxide, water, akali metals, various metals, zinc and sources of ignition.
Hazardous Decomposition Products	When involved in a fire, this product may generate toxic fumes, including chlorine, oxides of calcium, and hydrogen chloride.
Hazardous Reactions	A violent polymerisation occurs if calcium chloride is mixed with methyl vinyl ether. Reacts exothermically on dilution with water. Mildly corrosive to most metals. Metals will slowly corrode in aqueous solutions of calcium chloride. Aluminium (and alloys) and yellow brass will be attacked by calcium chloride. Calcium chloride reacts violently with a mixture of boron oxide and calcium oxide. Calcium chloride reacts violently with bromine trifluoride.

11. TOXICOLOGICAL INFORMATION

Toxicity Data	Oral LD50 Rat: 1000mg/Kg Skin LD50 Rat: 2630mg/Kg Acute oral toxicity is determined in accordance with OECD Guideline 401. Skin Irritation Rabbit: Not irritating according to OECD Guideline 404. Eye Irritation Rabbit: Irritating according to OECD Guideline 405. The above information on oral acute toxicity and irritation refers to dry product. Oral LD50 Mus: 1940mg/Kg Primary Irritant Effect: On Skin: Irritant for skin and mucous membranes On eye : Irritant effect Sensitisation: No sensitising effect known. This product was not considered mutagenic. Ames test on Salmonella typhimurium was negative. To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

Health Effects - Acute

Swallowed	Moderately toxic by ingestion. Large amounts may cause nausea and vomiting.
Eye	Irritating to eyes.
Skin	Slightly toxic by dermal absorption. Contact with skin may result in irritation.
Inhaled	Inhalation of product dust may cause irritation to the respiratory system. Material may be irritant to the mucous membranes of the respiratory tract.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Fathead Minnow LC50 96hr: 4630mg/L Daphnia LC50 48hr: 2770mg/L Nitzschia LC50 120hr: 3130mg/L The product is not acutely toxic to water organisms. Information about ecotoxicity refers to dry product. Other information: The product increases the hardness of water.
Persistence and Degardability	This product will not biodegrade (inorganic product).
Mobility	Soluble in water and mobile.
Environmental Fate (Exposure)	Avoid contaminating waterways, drains and sewers.
Bioaccumulative Potential	This product does not bioaccumulate in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill or Incineration	Contact a specialist disposal company or the local waste regulator for advice. This should be done in accordance with 'The Hazardous Waste Act'. This material may be suitable for approved landfill.

14. TRANSPORT INFORMATION

Land Transport (Australia)

Regulation Name	ADG
UN Number	Not applicable.
Shipping Name	CALCIUM CHLORIDE ANHYDROUS
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	IRRITANT
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

Sea Transport

Regulation Name	IMDG
UN Number	Not applicable.
Shipping Name	CALCIUM CHLORIDE ANHYDROUS
Dangerous Goods	Not applicable.
Subsidiary Risk	

Class	Not applicable.
Pack Group	Not applicable.
Precaution for User	IRRITANT
Hazchem Code	No data available.
EPG	No data available.
Special Provision	Not applicable.

Air Transport

Regulation Name	IATA
UN Number	Not applicable.
Shipping Name	CALCIUM CHLORIDE ANHYDROUS
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	IRRITANT
Hazchem Code	No data available.
EPG	No data available.
Special Provision	Not applicable.

Land Transport (New Zealand)

Regulation Name	NZS5433
UN Number	Not applicable.
Shipping Name	CALCIUM CHLORIDE ANHYDROUS
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	IRRITANT
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

15. REGULATORY INFORMATION

Poisons Schedule	N/A
EPG	N/A
AICS Name	CALCIUM CHLORIDE (CaCl2)
NZ Toxic Substance	N
HSNO Hazard Classification	

	6.1D 6.3A 6.4A 9.3C
ERMA Approval Code	HSR003389

16. OTHER INFORMATION

Literature References	No data available.
Sources for Data	No data available.

Legend to Abbreviations and Acronyms

<	less than
>	greater than
ADG	Australian Dangerous Goods Code
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstracts Service (Registry Number)
cm2	square centimetres
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
deg C ('C)	degrees Celsius
ERMA	Environmental Risk Management Authority
g	gram
g/cm3	grams per cubic centimetre
g/l	grams per litre
HSNO	Hazardous Substance and New Organism
IATA	International Air Transport Association Dangerous Goods Regulations
IDLH	Immediately Dangerous to Life and Health
IMDG	International Maritime Dangerous Goods Code
immiscible	liquids are insoluble in each other
kg	kilogram
kg/m3	kilograms per cubic metre
LC50	LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50	LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals
ltr	Litre
m3	cubic metre
mbar	millibar
mg	milligram
mg/24H	milligrams per 24 hours
mg/kg	milligrams per kilogram

mg/m3	milligrams per cubic metre
Misc	miscible
miscible	liquids form one homogeneous liquid phase regardless of the amount of either component present
mm	millimetre
mPa.s	milli Pascal per second
N/A	Not Applicable
NOHSC	National Occupational Health and Safety Commission
OECD	Organization for Economic Co-operation and Development
PEL	Permissible Exposure Limit
ppb	parts per billion
ppm	parts per million
ppm/2h	parts per million per 2 hours
ppm/6h	parts per millionper 6 hours
RCP	Reciprocal Calculation Procedure
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
tne	tonne
TWA	Time Weighted Average
ug/24H	micrograms per 24 hours
UN	United Nations (number)
wt	weight

Australia	New Zealand
Adelaide	Auckland
Brisbane	Christchurch
Melbourne	Hawke's Bay
Perth	
Sydney	

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This MSDS summarises Redox Pty Ltd best knowledge of the health and safety hazard information of the selected substance and how to safely handle the selected substance in the workplace however Redox Pty Ltd expressly disclaims that the MSDS is a representation or guarantee of the chemical specifications for the substance.

Each user should read the MSDS and consider the information in the context of how the selected substance will be handled and used in the workplace including its use in conjunction with other substances.

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION

Revision Date	JULY 2010
Product Name	GUAR GUM
Other Names	GUAR GUM (CYAMOPSIS TETRAGONOLOBUS); CYAMOPSIS GUM; GUAR FLOUR; GUARAN; GUM CYANOPSIS;
Uses	Stabiliser/thickener. Food applications.

Contact Information

Organisation	**Location**	**Telephone**	**Ask For**
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61 2 97333000	Technical Officer
	11 Mayo Road Wiri Auckland 2104 New Zealand	+64 9 2506222	
Poison Information Centre	Westmead NSW Australia	131126	
Chemcall 24 Hour Emergency Number	Australia	1800-127406	
	New Zealand	0800-243622	
National Poisons Centre	New Zealand	0800-764766	

2. HAZARD IDENTIFICATION

NOT Hazardous according to criteria of NOHSC/ASCC.

Risk Phrases	No data available.
Safety Phrases	No data available.
ERMA New Zealand Approval Code	HSR002732
HSNO Hazard Classification	6.3B 6.5A 6.5B 9.1D

This Material Safety Data Sheet may not provide exhaustive guidance for all HSNO Controls assigned to this substance. The ERMA Web Site should be consulted for a full list of triggered controls and cited regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	**CAS Number**	**Proportions (%)**

GUAR GUM	[9000-30-0]	100.0

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure.

Swallowed	Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek medical advice.
Eye	If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.
Skin	If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.
Inhaled	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. Seek medical advice if effects persist.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient. Material swells on contact with water.
Aggravated medical conditions caused by exposure	No information available on medical conditions which are aggravated from exposure to this product.

5. FIRE FIGHTING MEASURES

Extinguishing Media	In case of fire, appropriate extinguishing media include Dry agent (carbon dioxide, dry chemical powder) - water MUST NOT be allowed to come into contact with substance, forms a very slippery surface and may cause accidents.
Hazards from Combustion Products	Combustible solid. Avoid dust generation. In common with many organic chemicals, may form flammable dust clouds in air. Incompatible with strong oxidising agents, and sources of ignition. On burning will emit toxic fumes, including those of oxides of carbon.
Special Protective Precautions and Equipment for Fire Fighters	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves). Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Flammability Conditions	Product is a combustible solid.

Additional Information

Hazchem Code	N/A

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures	Avoid accidents, clean up immediately. Slippery when spilt. Personnel involved in the clean up should wear full protective clothing as listed in section 8. Evacuate all unnecessary personnel. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger

area. Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management. Use clean, non-sparking tools and equipment. The material is not explosive, nor does it release any obnoxious gases. But if water is mixed with spilled powder, the floor should be thoroughly cleaned to remove slippery effect on floors.

Methods and Materials for Containment and Clean Up	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled chemical-waste container and hold for safe disposal.

7. HANDLING AND STORAGE

Precautions for Safe Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes. Hooks should not be used for handling bags, and not thrown while shifting. The powder should not be kept in the open air since it is susceptible to moisture.
Conditions for Safe Storage (Including Any Incompatibles)	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Protect from direct sunlight, moisture and static discharges. Store under atmospheric temperature. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container Type	Store in original packaging as approved by manufacturer. The material is packaged in multiwall paper bags with polyethylene lining - 25Kg net.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These 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 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.
Biological Limit Values	No information available on biological limit values for this product.
Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection	RESPIRATOR: Wear a P2 particulate respirator when handling this product (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: Wear impervious gloves (AS2161). CLOTHING: Long-sleeved protective clothing and safety footwear (AS3765/2210).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Creamy/White Free-flowing Powder
Formula	Unspecified
Odour	Slight, Bean-like
Vapour Pressure	Not applicable.
Vapour Density	Not applicable.
Boiling Point	Not applicable.
Melting Point	Not applicable.
Solubility in Water	Excellent in water
Specific Gravity	0.68 (Water = 1)
Flash Point	Test Unknown 300'C
pH	5.00-6.00 ()

Lower Explosion Limit

Upper Explosion Limit

Ignition Temperature

Specific Heat Value

Particle Size

Volatile Organic Compounds (VOC) Content

Evaporation Rate

Viscosity

Percent Volatile

Octanol/Water partition coefficient

Saturated Vapour Concentration

Additional Characteristics

Flame Propagation/Burning Rate of Solid Materials

Properties of Materials That May Initiate or Contribute to Fire Intensity

Potential for Dust Explosion

Reactions that Release Flammable Gases

Fast of Intensely Burning

Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
3000-7000 cps
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
Not applicable.
170'C
Solubility In Other Substances: Not very readily soluble

Characteristics	
Non-flammables That Could Contribute Unusual Hazards to a Fire	
Release of Invisible Flammable Vapours and Gases	
Decomposition Temperature	
Additional Information	

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Avoid excessive heat, direct sunlight, static discharges, open flame, sources of ignition, dust generation and high temperatures.
Incompatible Materials	Incompatible with strong oxidising agents, and sources of ignition.
Hazardous Decomposition Products	On burning will emit toxic fumes, including those of oxides of carbon.
Hazardous Reactions	Hazardous polymerization will not occur. No dangerous reaction with any material.

11. TOXICOLOGICAL INFORMATION

Toxicity Data	Oral LD50 Rat: 6770mg/Kg

Health Effects - Acute

Swallowed	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin	Repeated or prolonged skin contact may lead to irritation.
Inhaled	Breathing in dust may result in respiratory irritation.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Algae: Nil - the material when mixed with water it will form a paste and remain for 24 hrs, by which time the paste is to be consumed.
Persistence and Degardability	The material is biodegradable.
Mobility	No information available on mobility for this product. Soluble in water.
Environmental Fate (Exposure)	Avoid contaminating waterways, drains and sewers.
Bioaccumulative Potential	No information available on bioaccumulation for this product.

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill or Incineration	Contact a specialist disposal company or the local waste regulator for advice. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Land Transport (Australia)

Regulation Name	ADG
UN Number	Not applicable.
Shipping Name	GUAR GUM
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

Sea Transport (New Zealand)

Regulation Name	IMDG
UN Number	Not applicable.
Shipping Name	GUAR GUM
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

Air Transport

Regulation Name	IATA
UN Number	Not applicable.
Shipping Name	GUAR GUM
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
	No data available.

Hazchem Code	No data available.
EPG	Not applicable.
Special Provision	

Land Transport (New Zealand)

Regulation Name	NZS5433
UN Number	Not applicable.
Shipping Name	GUAR GUM
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

15. REGULATORY INFORMATION

Poisons Schedule	N/A
EPG	N/A
AICS Name	GUAR GUM
NZ Toxic Substance	N
HSNO Hazard Classification	6.3B 6.5A 6.5B 9.1D
ERMA Approval Code	HSR002732

16. OTHER INFORMATION

Literature References	No data available.
Sources for Data	No data available.

Legend to Abbreviations and Acronyms

<	less than
>	greater than
ADG	Australian Dangerous Goods Code
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstracts Service (Registry Number)
cm2	square centimetres
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
deg C ('C)	degrees Celsius
ERMA	Environmental Risk Management Authority
g	gram

g/cm3	grams per cubic centimetre
g/l	grams per litre
HSNO	Hazardous Substance and New Organism
IATA	International Air Transport Association Dangerous Goods Regulations
IDLH	Immediately Dangerous to Life and Health
IMDG	International Maritime Dangerous Goods Code
immiscible	liquids are insoluble in each other
kg	kilogram
kg/m3	kilograms per cubic metre
LC50	LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50	LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals
ltr	Litre
m3	cubic metre
mbar	millibar
mg	milligram
mg/24H	milligrams per 24 hours
mg/kg	milligrams per kilogram
mg/m3	milligrams per cubic metre
Misc	miscible
miscible	liquids form one homogeneous liquid phase regardless of the amount of either component present
mm	millimetre
mPa.s	milli Pascal per second
N/A	Not Applicable
NOHSC	National Occupational Health and Safety Commission
OECD	Organization for Economic Co-operation and Development
PEL	Permissible Exposure Limit
ppb	parts per billion
ppm	parts per million
ppm/2h	parts per million per 2 hours
ppm/6h	parts per millionper 6 hours
RCP	Reciprocal Calculation Procedure
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
tne	tonne
TWA	Time Weighted Average
ug/24H	micrograms per 24 hours
UN	United Nations (number)
wt	weight

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MATERIAL SAFETY DATA SHEET - HYACID

1. IDENTIFICATION

Revision Date JUNE 2010

Product Name HYDROCHLORIC ACID

Other Names MURIATIC ACID; CHLOROHYDRIC ACID; HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE 28-36% HYDROCHLORIC ACID;

Uses Unspecified.

Contact Information

Organisation	Location	Telephone	Ask For
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61 2 97333000	Technical Officer
	11 Mayo Road Wiri Auckland 2104 New Zealand	+64 9 2506222	
Poison Information Centre	Westmead NSW Australia	131126	
Chemcall 24 Hour Emergency Number	Australia	1800-127406	
	New Zealand	0800-243622	
National Poisons Centre	New Zealand	0800-764766	

2. HAZARD IDENTIFICATION

Hazardous according to criteria of NOHSC/ASCC.

Dangerous According to the Australian Code for the Transport of Dangerous Goods.

Classified as Dangerous Goods According to NZS 5433:1999.

TOXIC CORROSIVE

Risk Phrases

R23 Toxic by inhalation.

R35 Causes severe burns.

Safety Phrases

S9	Keep container in a well-ventilated place.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

ERMA New Zealand Approval Code	HSR001557
HSNO Hazard Classification	6.1B 8.1A 8.2B 9.3A 9.1D 9.3C

This Material Safety Data Sheet may not provide exhaustive guidance for all HSNO Controls assigned to this substance. The ERMA Web Site should be consulted for a full list of triggered controls and cited regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	CAS Number	Proportions (%)
HYDROCHLORIC ACID	[7647-01-0]	28.0-36.0

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure.

Swallowed	Immediately rinse mouth with water. Give water to drink. DO NOT induce vomiting. If vomiting occurs give further water. Seek immediate medical attention.
Eye	SPEED IS ESSENTIAL! Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Take care not to rinse contaminated water into the non-affected eye. Seek immediate medical attention.
Skin	Remove contaminated clothing. Wash affected area with large quantities of water. Continue to wash skin for at least 10 minutes. Seek immediate medical attention.
Inhaled	Remove victim from exposure to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth to mouth method. Induce artificial respiration with the aid of a pocket mask equipped with a one way valve or other proper respiratory medical device. Seek medical attention immediately.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient. Following exposure, the patient should be kept under medical review for at least 48 hours as delayed pulmonary oedema may develop.
Aggravated medical conditions caused by exposure	Repeated exposure at low levels may produce erosion of the teeth and ulceration of the nasal septum and gums. High atmospheric contamination may lead to pulmonary oedema.

5. FIRE FIGHTING MEASURES

Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions. Use water spray to cool fire exposed containers.
Hazards from Combustion Products	Non-combustible liquid. Containers may burst if overheated. Incompatible with oxidising agents, most common metals, alkalis and sources of ignition. Hazardous decomposition products may include hydrogen chloride.
Special Protective Precautions and Equipment for Fire Fighters	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit. Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Flammability Conditions	Product is a non-flammable liquid. However, flammable hydrogen gas may be formed in contact with metals.

Additional Information

Hazchem Code	2R

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures	Personnel involved in the clean up should wear full protective clothing as listed in section 8. Avoid accidents, clean up immediately. Evacuate all unnecessary personnel. Increase ventilation. Avoid walking through spilled product as it is slippery when spilt. Stop leak if safe to do so. Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management. Use clean, non-sparking tools and equipment. Shut off all possible sources if ignition.
Methods and Materials for Containment and Clean Up	Soak up spilled product using absorbent non-combustible material such as sand or soil. Avoid using sawdust or cellulose. When saturated collect material, transfer to suitable, labelled, dry chemical-waste containers and dispose of promptly as hazardous waste. Spillages should be neutralised by the use of lime or lime slurry followed by water washing.

7. HANDLING AND STORAGE

Precautions for Safe Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product vapours. Avoid prolonged or repeated exposure. Provide adequate ventilation, including appropriate local extraction to ensure that the defined occupational exposure limit is not exceeded. Keep away from common metals, oxidising agents and alkalis. Remove contaminated clothing and wash before reuse.
Conditions for Safe	Store in a cool, dry, well-ventilated area. Keep containers tightly closed

Storage (Including Any Incompatibles)	when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Bulk quantities should be stored in rubber lined steel or suitable plastic equipment. Keep smaller quantities in suitable plastic or glass containers. This product has a UN classification of 1789 and a Dangerous Goods Class 8 Corrosive) according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container Type	Container type/packaging must comply with all applicable local legislation. Store in original packaging as approved by manufacturer. Bulk quantities should be stored in rubber lined steel or suitable plastic equipment. Keep smaller quantities in suitable plastic or glass containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	The following exposure standard has been established by The Australian Safety and Compensation Council (ASCC); Hydrochloric Acid CAS 7647-01-0: TWA = 5ppm (7.5 mg/m3 Peak Limitation) NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. Peak limitation is a ceiling concentration which should not be exceeded over a measurement period which should be as short as possible but not exceeding 15 minutes. These 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 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.
Biological Limit Values	No information available on biological limit values for this product.
Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Adequate ventilation should be provided so that exposure limits are not exceeded.
Personal Protection	RESPIRATOR: Wear an approved full-face piece respirator with high efficiency particulate filter (AS/NZS1715/1716). EYES: Wear chemical splash goggles in combination with a full-face shield (AS1336/1337). HANDS: Wear impervious, elbow-length neoprene or nitrile acid resistant gloves (AS2161). CLOTHING: Chemical-resistant coveralls, splash apron and safety footwear (AS3765/2210).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Almost colourless to Pale yellow Fuming Liquid
Formula	ClH
Odour	Characteristically Pungent
Vapour Pressure	11 (28% HCl, 20'C) mm Hg (1 atmosphere)
Vapour Density	Not applicable.
Boiling Point	97.7'C (28% HCl) deg C
Melting Point	-63'C (28% HCl) deg C

Solubility in Water	Soluble
Specific Gravity	1.14 (28% HCl,15'C) (Water = 1)
Flash Point	Not applicable.
pH	Not applicable.
Lower Explosion Limit	Not applicable.
Upper Explosion Limit	Not applicable.
Ignition Temperature	Not applicable.
Specific Heat Value	Not applicable.
Particle Size	Not applicable.
Volatile Organic Compounds (VOC) Content	Not applicable.
Evaporation Rate	Not applicable.
Viscosity	Not applicable.
Percent Volatile	Not applicable.
Octanol/Water partition coefficient	Not applicable.
Saturated Vapour Concentration	Not applicable.
Additional Characteristics	Not applicable.
Flame Propagation/Burning Rate of Solid Materials	Not applicable.
Properties of Materials That May Initiate or Contribute to Fire Intensity	Not applicable.
Potential for Dust Explosion	Product is a liquid.
Reactions that Release Flammable Gases	Corrosive to metals liberating hydrogen gas.
Fast of Intensely Burning Characteristics	Not applicable.
Non-flammables That Could Contribute Unusual Hazards to a Fire	Not applicable.
Release of Invisible	Not applicable.

Flammable Vapours and Gases	Not applicable.
Decomposition Temperature	
Additional Information	Boiling Point : 56.1'C (36% HCl) Vapour Pressure : 115 (36% HCl,20'C) Freezing Point : -27'C (36% HCl) Specific Gravity : 1.18 (36% HCl,15'C)

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature. Corrosive Liquid.
Conditions to Avoid	Avoid excessive heat, direct sunlight, moisture, static discharges, freezing and high temperatures.
Incompatible Materials	Incompatible with oxidising agents, most common metals, alkalis and sources of ignition.
Hazardous Decomposition Products	Hazardous decomposition products may include hydrogen chloride. Can react violently if in contact with oxidising agents, liberating chlorine gas. Attacks most common metals liberating hydrogen, which can form explosive mixtures with air.
Hazardous Reactions	Hazardous Polymerisation has not been reported. Can react violently if in contact with oxidising agents, liberating chlorine gas. Attacks most common metals liberating hydrogen, which can form explosive mixtures with air. Exothermic reaction with alkalis.

11. TOXICOLOGICAL INFORMATION

Toxicity Data	No toxicological information available for this product.

Health Effects - Acute

Swallowed	Will immediately cause corrosion of and damage to the gastrointestinal tract.
Eye	Causes burns. Risk of serious damage to eyes. May cause permanent impairment of vision.
Skin	Causes burns.
Inhaled	Mist vapour will cause irritation to the upper respiratory tract, coughing and choking sensation. Concentration of 50-100ppm are barely tolerated for up to 1 hour. Higher concentrations may cause corrosion of the respiratory tract. Fluid build up on the lung (pulmonary oedema) may occur up to 48 hours after exposure and could prove fatal.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Large discharges may contribute to the acidification of water and be fatal to fish and other aquatic life. Can cause damage to vegetation. Can cause severe damage to aquatic plants.

Persistence and Degardability	Will freely dissociate to hydrogen and chloride ions.
Mobility	The product is predicted to have high mobility in soil. Liquid with high volatility. The product is soluble in water.
Environmental Fate (Exposure)	Do not allow product to enter drains, waterways or sewers. Effect of Effluent Treatment: Large discharge may contribute to the acidification of effluent treatment systems and injure sewage treatment organisms.
Bioaccumulative Potential	The product does not bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill or Incineration	Contact a specialist disposal company or the local waste regulator for advice. This should be done in accordance with 'The Hazardous Waste Act'.

14. TRANSPORT INFORMATION

Land Transport (Australia)

Regulation Name	ADG
UN Number	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	2R
EPG	40 TOXIC AND/OR CORROSIVE SUBSTANCES Non-combustible - Water reactive
Special Provision	Not applicable.

Sea Transport

Regulation Name	IMDG
UN Number	

	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	No data available.
EPG	40 TOXIC AND/OR CORROSIVE SUBSTANCES Non-combustible - Water reactive
Special Provision	Not applicable.

Air Transport

Regulation Name	IATA
UN Number	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	No data available.
EPG	No data available.
Special Provision	Not applicable.

Land Transport (New Zealand)

Regulation Name	NZS5433

UN Number	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	2R
EPG	40 TOXIC AND/OR CORROSIVE SUBSTANCES Non-combustible - Water reactive
Special Provision	Not applicable.

Land Transport (Papua New Guinea)

Regulation Name	NZS5433
UN Number	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	2R
EPG	40 TOXIC AND/OR CORROSIVE SUBSTANCES Non-combustible - Water reactive
Special Provision	Not applicable.

Land Transport (Fiji)

Regulation Name

	NZS5433
UN Number	1789
Shipping Name	HYDROCHLORIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	II
Precaution for User	TOXIC CORROSIVE
Hazchem Code	2R
EPG	40 TOXIC AND/OR CORROSIVE SUBSTANCES Non-combustible - Water reactive
Special Provision	Not applicable.

15. REGULATORY INFORMATION

Poisons Schedule	6
EPG	40
AICS Name	HYDROCHLORIC ACID
NZ Toxic Substance	3
HSNO Hazard Classification	6.1B 8.1A 8.2B 9.3A 9.1D 9.3C
ERMA Approval Code	HSR001557

16. OTHER INFORMATION

Literature References	No data available.
Sources for Data	No data available.

Legend to Abbreviations and Acronyms

<	less than
>	greater than

ADG	Australian Dangerous Goods Code
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstracts Service (Registry Number)
cm2	square centimetres
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
deg C ('C)	degrees Celsius
ERMA	Environmental Risk Management Authority
g	gram
g/cm3	grams per cubic centimetre
g/l	grams per litre
HSNO	Hazardous Substance and New Organism
IATA	International Air Transport Association Dangerous Goods Regulations
IDLH	Immediately Dangerous to Life and Health
IMDG	International Maritime Dangerous Goods Code
immiscible	liquids are insoluble in each other
kg	kilogram
kg/m3	kilograms per cubic metre
LC50	LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50	LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals
ltr	Litre
m3	cubic metre
mbar	millibar
mg	milligram
mg/24H	milligrams per 24 hours
mg/kg	milligrams per kilogram
mg/m3	milligrams per cubic metre
Misc	miscible
miscible	liquids form one homogeneous liquid phase regardless of the amount of either component present
mm	millimetre
mPa.s	milli Pascal per second
N/A	Not Applicable
NOHSC	National Occupational Health and Safety Commission
OECD	Organization for Economic Co-operation and Development
PEL	Permissible Exposure Limit
ppb	parts per billion
ppm	parts per million
ppm/2h	parts per million per 2 hours

ppm/6h	parts per millionper 6 hours
RCP	Reciprocal Calculation Procedure
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
tne	tonne
TWA	Time Weighted Average
ug/24H	micrograms per 24 hours
UN	United Nations (number)
wt	weight

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Schlumberger

SAFETY DATA SHEET

(Australia)

According to the criteria of NOHSC:2011(2003)

Version: 1 *Revision date: 05 April 2011*

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Product Name: **Low-Temperature Liquid Dispersant D145A**

Product Code: **D145A**

Company Identification:

Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000

Emergency Telephone Number: 1-800-039-008 (24hr)

Use of the Substance/Preparation: Used as a cementing additive in oilfield applications.

2. HAZARDS IDENTIFICATION

Most important hazards

Risk Combination Phrases Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Health hazards: This product may contain formaldehyde as an impurity. Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.

Environmental hazard: According to the results of tests of biodegradability this product is not readily biodegradable.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	EC-No.	Weight % - Range	Classification
Amine polymer derivative		Listed	15 - 40	R52/53

For the full text of the R phrases mentioned in this Section, see Section 16

4. FIRST AID MEASURES

Inhalation: Move to fresh air.

Skin contact: Rinse immediately with plenty of water for at least 5 minutes.

Eye contact: Immediately flush eyes with water for 5 minutes while holding eyelids open. Seek medical attention if irritation occurs.

Ingestion: Rinse mouth. Drink 1 or 2 glasses of water. Seek medical attention if irritation occurs.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	The product itself does not burn. Compatible with all types.
Extinguishing media which must not be used for safety reasons:	None known.
Special protective equipment for firefighters:	Wear protective fire fighting clothing and avoid breathing vapors. Use self-contained breathing apparatus in closed areas.
Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases:	When heated strongly or burned, oxides of carbon, sulfur oxides and harmful organic chemical fumes are released. formaldehyde.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Use personal protective equipment. See also section 8.
Environmental precautions:	Prevent further leakage or spillage. Keep out of waterways.
Methods for cleaning up:	Dam up. Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container.

7. HANDLING AND STORAGE

Handling:

Technical measures/Precautions:	No special precautions required.
Safe handling advice:	none.

Storage:

Technical measures/Storage conditions:	Freezing will affect the physical condition but will not damage the material. Thaw and mix before using. Keep containers tightly closed in a dry, cool and well-ventilated place.
Packaging requirements:	High density polyethylene (HDPE) drum.
Incompatible products:	Oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures to reduce exposure:	No special technical protective measures required
Respiratory protection:	No personal respiratory protective equipment normally required.
Hand protection:	PVC disposable gloves

Eye protection: Safety glasses.

Skin and body protection: Clean, body-covering clothing. Remove and wash contaminated clothing before re-use.

Environmental exposure controls

Exposure limit(s)

Component	Australia - Occupational Exposure Standards - TWAs	Australia - Occupational Exposure Standards - STELs
Amine polymer derivative	None	None

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Form:	Liquid
Odour:	Faint / formaldehyde
Colour:	Clear to hazy yellow

Important Health, Safety and Environmental Information

pH:	9-12
Boiling point/range:	100 °C
Flash point:	Does not flash.
Explosive properties:	
Explosion data - sensitivity to mechanical impact:	Not applicable None
Explosion data - sensitivity to static discharge:	None known
Flammability Limits in Air:	
lower:	Not applicable
upper:	Not applicable
Oxidizing properties:	None
Relative density:	1.24 (20°C)
Solubility:	
Water solubility:	Soluble
Fat solubility:	No information available.
Partition coefficient (n-octanol/water):	See also section 12
Viscosity:	50 mPa.s (20 °C)
Vapour density:	similar to water.
Vapour pressure:	similar to water.
Evaporation rate:	No data available.

Other information

Melting point/range:	100 °C

10. STABILITY AND REACTIVITY

Stability: Stable under recommended storage conditions.

Conditions to avoid: None reasonably foreseeable.

Materials to avoid: Oxidizing agents

Hazardous decomposition products:	When heated strongly or burned, oxides of carbon, sulfur oxides, nitrogen oxides, ammonia and harmful organic fumes are released. formaldehyde.
Hazardous polymerization:	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Local effects

Skin:	No effect expected.
Eyes:	No effect expected.
Inhalation:	No effect expected.
Ingestion:	No effect expected.
Sensitization - skin:	May cause sensitization by skin contact.
Sensitization - lung:	Not known to cause allergic reaction

Chronic Health Hazard

Carcinogenic effects:	This product may contain formaldehyde as an impurity. Formaldehyde is listed by IARC in Group 1 as carcinogenic to humans.
Mutagenic effects:	Not known to cause heritable genetic damage.
Teratogenic effects:	Not known to cause birth defects or have a deleterious effect on a developing fetus.
Reproductive toxicity:	Not known to adversely affect reproductive functions and organs.
Target organ effects:	None known.

12. ECOLOGICAL INFORMATION

Ecotoxicity

COMPONENT INFORMATION

Amine polymer derivative

Bioaccumulation:	log Pow = -5
Persistence and degradability:	17 % (28d; OECD306)
Algae toxicity:	72h EC50= 60-100 mg/l (Skeletonema costatum)

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products:	Dispose of as special waste in compliance with local and national regulations
Contaminated packaging:	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal

14. TRANSPORT INFORMATION

UN number:	None
Shipping name:	Not regulated.

ADR/RID

Class:	Not regulated

IMDG/IMO

Class or Div.:	Not regulated

ICAO/IATA

Class or Div.:	Not regulated

15. REGULATORY INFORMATION

In accordance with the criteria of NOHSC

Indication of danger:
None

R-phrase(s):

-
- R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S-phrase(s):
Exercise reasonable care and cleanliness

International Inventories

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

16. OTHER INFORMATION

- R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Prepared by: Chemical Regulatory Compliance

End of Safety Data Sheet

Material Safety Data Sheet (MSDS)

MSDS No. CA 001

Portland Cement

Section 1: Identification of the Material and Supplier

Company Details:

Cement Australia Pty Limited

ABN 75 104 053 474
12 Station Avenue
Darra
Queensland 4075

Tel: 1300 CEMENT (1300 236 368)
Fax: 1800 CEMENT (1800 236 368)
Website: www.cementaustralia.com.au

Manufacturing Plants

Gladstone:	Landing Rd, Fisherman's Landing, Gladstone QLD 4680
Brisbane:	77 Pamela St, Pinkenba QLD 4008
Kandos:	Jamieson St, Kandos NSW 2848
Railton:	Cement Works Rd, Railton, TAS 7305

Product:	**Portland Cement**
Other Names:	General Purpose Cement Shrinkage Limited Cement HE (High Early) Cement Off White Cement Grey Cement
Use:	Portland Cement is used as a binder in concrete, concrete masonry, mortar and grouts. It is also used in the manufacture of fibre cement products, in soil stabilisation in building construction and civil engineering projects.

Section 2: Hazards Identification

Hazardous Substance. Non-dangerous Goods

Risk Phrases	Safety Phrases
R20/21/22: Harmful by inhalation, in contact with skin and if swallowed.	**S22:** Do not breathe dust.
R36/37/38: Irritating to eyes, respiratory system and skin.	**S24/25:** Avoid contact with skin and eyes.
R43: May cause sensitisation by skin contact.	**S29:** Do not empty into drains.
R66: Repeated exposure may cause skin dryness or cracking.	**S36/37/39:** Wear suitable protective clothing, gloves and eye/face protection.

Section 3: Composition/Information on Ingredients

Portland Cement consists of a crystalline mass manufactured from substances mined from the earth's crust. It contains trace amounts of naturally occurring, but potentially hazardous chemical entities including metals such as chromium and nickel and crystalline silica. All significant constituents are listed below:

Chemical Entity	Proportion	CAS Number
Portland Cement Clinker	<97%	65997-15-1
Gypsum ($CaSO_4\ 2H_2O$)	2-5%	10101-41-4
Limestone ($CaCO_3$)	0-7.5%	1317-65-3
Calcium Oxide	0-3%	1305-78-8
Hexavalent Chrome (Cr VI)	<20 ppm	1333-82-0
Crystalline Silica (Quartz)	<1%	14808-60-7

Section 4: First Aid Measures

Swallowed:	Rinse mouth and lips with water. Do not induce vomiting. Give water to drink to dilute stomach contents. If symptoms persist, seek medical attention.
Eyes:	Flush thoroughly with flowing water for 15 minutes to remove all traces. If symptoms such as irritation or redness persist, seek medical attention. If wet cement is splashed in the eye, always treat as above, and seek urgent medical attention.
Skin:	Remove heavily contaminated clothing immediately. Wash off skin thoroughly with water. Use a mild soap if available. Shower if necessary. Seek medical attention for persistent irritation or burning of the skin.
Inhaled:	Remove to fresh air, away from dusty area. If symptoms persist, seek medical attention.
First Aid Facilities:	Eye wash station. Washing facilities with running water.
Advice to Doctor:	Treat symptomatically. Wet cement burns to skin or eye may result in corrosive caustic burns. Ingestion of significant amounts of cement dry or wet is unlikely. Do not induce emesis or perform gastric lavage. Neutralization with acidic agents is not advised because of increased risks of exothermic burns. Water-mineral oil soaks may aid in removing hardened cement from the skin. Ophthalmological opinion should be sought for ocular burns..

Section 5: Fire Fighting Measures

Fire/Explosion Hazard:	None
Hazchem Code:	None allocated
Flammability:	Not flammable
Extinguishing Media:	None required
Hazards from Combustion Products:	None
Special Protective Precautions and equipment for fire fighters:	None required

Section 6: Accidental Release Measures

Spills:	Spills are best cleaned up by vacuum device to avoid generating airborne dust. Recommendations on Exposure Control and Personal Protection should be followed during spill clean-up. Keep product out of storm water and sewer drains. Wetting during clean-up will cause formation of setting cement.

Section 7: Handling and Storage

Handling: When supplied in bags these need to be handled in accordance with manual handling Regulations and Code of Practice.

Storage: Protect from moisture to prevent hardening. Storage of cement may be in concrete silos, steel bins, or plastic lined multi-ply paper bags.

Section 8: Exposure Controls/Personal Protection

Exposure Limits: **National Occupational Health & Safety Commission (NOHSC) Australia Occupational Exposure Standard:**

Exposure to dust should be kept as low as practicable, and below the following OES.
Portland Cement: 10mg/m^3 TWA (time-weighted average) as inspirable dust.
Crystalline silica (quartz): 0.1 mg/m^3 TWA as respirable dust (≤ 7 microns particle equivalent aerodynamic diameter).
Chromium VI (hexavalent): 0.05 mg/m^3 - sensitiser.

Engineering Controls: All work with dry cement should be carried out in such a way as to minimise dust generation, exposure to dust and repeated or extended skin contact. When handling dry cement, use local mechanical ventilation or extraction in areas where dust could escape into the work environment. For bulk deliveries, closed pumping systems are recommended. For handling of individual bags, follow instructions below if no local exhaust ventilation is available. Local dust extraction and collection may be used, if necessary, to control airborne dust levels. Work methods and engineering should aim to minimise contact with wet cement onto exposed skin. Work areas should be cleaned regularly.

Personal Protection:

Skin: Minimise contact with Portland Cement materials. When handling dry or wet cement, wet concrete, mortar or grout, personnel should wear protective clothing and impervious footwear, and gloves such as PVC (see Australian and New Zealand Standards AS/NZS 4501 and AS 2161). Never kneel in wet cement, or allow extended contact of skin with wet cement.

Remove clothing which has become contaminated with wet or dry cement to avoid prolonged contact with the skin. If cement gets into boots, remove socks and boots immediately and wash skin thoroughly. Wash work clothes regularly. To avoid contamination of face and lips and ingestion, wash hands before eating or smoking.

Eyes: Splash resistant Safety Glasses with side shields or safety goggles (AS/NZ 1336) or a face shield should be worn to ensure all contact with eyes is avoided.

Respiratory: Where engineering and handling controls are not adequate to minimise exposure to total dust and to respirable crystalline silica wear a suitable P1 or P2 particulate respirator (AS/NZS 1715 and AS/NZS 1716). Use only respirators that bear the Australian Standards mark and are fitted and maintained correctly. For dust levels approaching or exceeding the NES (see above) a more effective particulate respirator as described in AS/NZS 1715 should be worn. Procedures for effective use of respirators should be applied and supervised..

Section 9: Physical and Chemical Properties

Appearance:	A fine powder ranging in colour from grey to off-white
Odour:	No distinctive odour
Boiling/Melting Point:	Melting point >1200°C
Vapour Pressure:	Not applicable
Specific Gravity:	3.0 – 3.2
Flash Point:	Non applicable
Flammability Limits:	Not applicable
Solubility In Water:	Slight, reacts on mixing with water forming an alkaline (caustic) solution (pH >11)
Particle Size:	Up to 50% of the fresh dry material may be respirable (below 10 microns)

Section 10: Stability and Reactivity

Chemical Stability:	Chemically stable
Conditions to Avoid:	Keep free of moisture
Incompatible Materials:	None
Hazardous Decomposition Products:	None
Hazardous Reactions:	None

Section 11: Toxicological Information

Portland Cements are stable substances, compatible with most other building materials, will not decompose into hazardous by-products and do not polymerise.

Short Term (Acute) Exposure

Swallowed:	Unlikely under normal industrial use. Mildly abrasive and corrosive to mouth and throat if swallowed. May cause nausea, stomach cramps and constipation.
Eyes:	Irritating and corrosive to the eyes and may cause alkaline burns. Cement dust is irritating to the eyes. Exposure to dust may aggravate existing eye irritations.
Skin:	Dust is irritating and drying to the skin. Direct contact with wet cement may cause serious skin burns. Within 12 to 48 hours (after one- to six-hour exposures) possible first, second or third degree burns may occur. There may be no obvious pain at the time of the exposure. Chronic skin disorders may be aggravated by exposure to dust or contact with wet cement.
Inhaled:	Cement dust is irritating to the nose, throat and respiratory tract causing coughing and sneezing. Pre-existing upper respiratory and lung diseases including asthma and bronchitis may be aggravated.

Section 11: Toxicological Information (Cont'd)

Long Term (Chronic) Exposure

Eyes:	Dust may cause irritation and inflammation of the cornea.
Skin:	Repeated contact causes irritation and drying of the skin and can result in skin reddening and skin rash (dermatitis). Over time this may become chronic and can also become infected. Persons who are allergic to chromium may develop an allergic dermatitis which aggravates the irritant effects and this combination can lead to chronic cement dermatitis and serious disability particularly affecting the hands.
Inhaled:	Repeated exposure to the dust may result in increased nasal and respiratory secretions and coughing. Inflammation of lining tissue of the respiratory system may follow repeated exposure to high levels of dust, with increased risk of bronchitis and pneumonia. Repeated and prolonged exposure to dust levels which exceed the OES for crystalline silica (see above) may occur. This can cause bronchitis, and silicosis (scarring of the lung). Long term overexposure to respirable crystalline silica dust may increase the risk of other irreversible and serious disorders including scleroderma (a disease affecting the connective tissue of the skin, joints, blood vessels and internal organs). Cement (Portland Cement) is not classified as a carcinogen by NOHSC. Of the ingredients Hexavalent Chromium (Cr VI) is classified as a carcinogen by NOHSC. There is debate in the medical literature concerning whether there is any risk of lung cancer arising from long term high overexposure to respirable crystalline silica. Risk of lung cancer has not been identified from using Portland Cements containing silica. The International Agency for Research on Cancer (IARC) has classified crystalline silica, inhaled in the form of quartz or cristobalite from occupational sources, as carcinogenic to humans (Group 1). NOHSC has not classified crystalline silica as a carcinogen.

Section 12: Ecological Information

Ecotoxicity:	Product forms an alkaline slurry when mixed with water.
Persistence and Degradability:	Product is persistent and would have a low degradability.
Mobility:	A low mobility would be expected in a landfill situation.

Section 13: Disposal Considerations

Portland Cement can be treated as a common waste for disposal or dumped into a landfill site, in accordance with local authority guidelines.

Keep material out of storm water and sewer drains.

Measures should be taken to prevent dust generation during disposal, and exposure and personal precautions should be observed (see above).

Section 14: Transport Information

Transportation is done in bulk or bag form by Ship, Rail and Road.

UN Number:	None allocated
Proper Shipping Name:	None allocated
Class and Subsidiary Risk:	None allocated
Packing Group:	None allocated
Special precautions for user:	Avoid generating and breathing dust
Hazchem Code:	None allocated

Section 15: Regulatory Information

Portland cement is not classified as Dangerous Goods.

Classified as Hazardous according to the criteria of the National Occupational Health and Safety Commission (NOHSC) Approved Criteria For Classifying Hazardous Substances [NOHSC:1008] 3rd Edition

Exposures by inhalation to high levels of dust may be regulated under the Hazardous Substances Regulations (State) as they are applicable to Respirable Crystalline Silica, requiring exposure assessment, controls and health surveillance (NOHSC).

Section 16: Other Information

For further information on this product contact:	Telephone: (07) 3375 0501 (Business Hours) Facsimile: (07) 3375 0473 Contact Person: Technical Manager
Emergency Contact Number:	Telephone: (07) 3375 0501 (Business Hours) or Poisons Information Centre 13 11 26

Next Review Date for this MSDS: 31 December 2016.

Australian and New Zealand Standards:

AS 2161: Industrial Safety Gloves and Mittens (excluding electrical and medical gloves).
AS/NZ 1336: Recommended Practices for Occupational Eye Protection.
AS/NZS 1715: Selection, use and maintenance of respiratory protective devices.
AS/NZS 1716: Respiratory protective devices.
AS/NZS 4501: Occupational protective clothing.

Advice Note:

Cement Australia believes the information in this document to be accurate as at the date of preparation noted below, but, to the maximum extent permitted by law, Cement Australia accepts no responsibility for any loss or damage caused by any person acting or refraining from action because of this information.

The provision of this information should not be construed by anyone as a recommendation to use this product. In particular, no one should use any product in violation of any patent or other intellectual proprietary rights or in breach of any statute or regulation.

Users should rely on their own knowledge and inquiries and make their own determination as to the applicability of this information in relation to their particular purposes and specific circumstances. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace and in conjunction with other substances or products.

This MSDS must be reviewed before 31 December 2016.

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION

Revision Date	JUNE 2007
Product Name	POTASSIUM CHLORIDE
Other Names	POTASSIUM CHLORIDE POTASSIUM CHLORIDE (KCl)
Uses	Catalyst in petrochemical and pharmaceutical synthesis.

Contact Information

Organisation	Location	Telephone	Ask For
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61 2 97333000	Technical Officer
	11 Mayo Road Wiri Auckland 2104 New Zealand	+64 9 2506222	
Poison Information Centre	Westmead NSW Australia	131126	
Chemcall 24 Hour Emergency Number	Australia	1800-127406	
	New Zealand	0800-243622	
National Poisons Centre	New Zealand	0800-764766	

2. HAZARD IDENTIFICATION

NOT Hazardous according to criteria of NOHSC/ASCC.

Risk Phrases	No data available.
Safety Phrases	No data available.
ERMA New Zealand Approval Code	HSR003261
HSNO Hazard Classification	6.1E 6.3B 6.4A 9.3B

This Material Safety Data Sheet may not provide exhaustive guidance for all HSNO Controls assigned to this substance. The ERMA Web Site should be consulted for a full list of triggered controls and cited regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	CAS Number	Proportions (%)
POTASSIUM CHLORIDE	[7447-40-7]	99.0-99.5

POTASSIUM CHLORIDE	[7447-40-7]	99.0-99.5
SODIUM CHLORIDE	[7647-14-5]	0.5

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure.

Swallowed	Rinse mouth with water. Give plenty of water to drink provided victim is conscious. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Seek medical attention immediately.
Eye	Immediately flush eyes with plenty of water for 20 minutes, holding eyelids open. Seek medical attention immediately.
Skin	Remove contaminated clothing. Wash affected area with plenty of Soap and water for at least 15 minutes. Wash clothing before reuse. If irritation occurs, seek medical advice.
Inhaled	Remove victim from exposure to fresh air. If not breathing, apply artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient. In case of ingestion, the salt level in the blood must be determined.
Aggravated medical conditions caused by exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions.
Hazards from Combustion Products	Non-combustible solid. Incompatible with bromine trifluoride, sulfuric acid (at 600'C), and sources of ignition. When heated to decomposition, may release poisonous and corrosive fumes of potassium oxides, chlorine and hydrogen chloride.
Special Protective Precautions and Equipment for Fire Fighters	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves). Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Flammability Conditions	Product is a non-flammable solid.

Additional Information

Hazchem Code	N/A

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures	Avoid accidents, clean up immediately. Slippery when spilt. Personnel involved in the clean up should wear full protective clothing as listed in section 8. Evacuate all unnecessary personnel. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger

	area. Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management. Use clean, non-sparking tools and equipment.
Methods and Materials for Containment and Clean Up	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled container and dispose of promptly. Ventilate area and wash spill site after material pickup is complete.

7. HANDLING AND STORAGE

Precautions for Safe Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes.
Conditions for Safe Storage (Including Any Incompatibles)	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods by Road and Rail.
Container Type	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust).
Biological Limit Values	No information available on biological limit values for this product.
Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection	RESPIRATOR: Wear an effective dust mask where dusts are generated (AS1715/1716). EYES: Chemical safety goggles (AS1336/1337). HANDS: Protective gloves (AS2161). CLOTHING: Long-sleeved protective coveralls and safety footwear (AS3765/2210).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	White Crystals
Formula	KCl
Odour	No data available.
Vapour Pressure	Not applicable.
Vapour Density	Not applicable.
Boiling Point	1500'C (Sublimation) deg C
Melting Point	773'C deg C
Solubility in Water	28.1g/100mL (0'C)
Specific Gravity	1.987 (Water = 1)
Flash Point	Not applicable.

pH	7 ( )
Lower Explosion Limit	Not applicable.
Upper Explosion Limit	Not applicable.
Ignition Temperature	Not applicable.
Specific Heat Value	Not applicable.
Particle Size	Not applicable.
Volatile Organic Compounds (VOC) Content	Not applicable.
Evaporation Rate	Not applicable.
Viscosity	Not applicable.
Percent Volatile	Not applicable.
Octanol/Water partition coefficient	Not applicable.
Saturated Vapour Concentration	Not applicable.
Additional Characteristics	Not applicable.
Flame Propagation/Burning Rate of Solid Materials	Not applicable.
Properties of Materials That May Initiate or Contribute to Fire Intensity	Not applicable.
Potential for Dust Explosion	Not applicable.
Reactions that Release Flammable Gases	Not applicable.
Fast of Intensely Burning Characteristics	Not applicable.
Non-flammables That Could Contribute Unusual Hazards to a Fire	Not applicable.
Release of Invisible Flammable Vapours and Gases	Not applicable.
Decomposition Temperature	>700'C
Additional Information	Molecular Weight: 74.55g/mol Solubility : Soluble in ether, glycerine, and alcohol methanol.

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Heating to above decomposition temperature.
Incompatible Materials	Incompatible with bromine trifluoride, sulfuric acid (at 600'C), and sources of ignition.
Hazardous Decomposition Products	When heated to decomposition, may release poisonous and corrosive fumes of potassium oxides, chlorine and hydrogen chloride.
Hazardous Reactions	Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicity Data	Oral LD50 Rat: 2600mg/Kg Mutagenicity: Not mutagenic by the Ames Test Positive in chromosomal aberrations test (hamster's V79 cells) Negative in DNA damage and repair assay (rat hepatocytes) Carcinogenicity: Not included in NTP 11th report on Carcinogens Not classified by IARC, OSHA, EPA.

Health Effects - Acute

Swallowed	Large oral doses may cause gastro-intestinal irritation, purging, weakness, and circulaory disorders.
Eye	Irritating to eyes.
Skin	No information available on the symptoms of skin contact for this product.
Inhaled	No information available on the symptoms of inhalation for this product.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Fathead minnow LC50/96hr (Fish) : 880mg/L Daphnia magna LC50/48hr : 357mg/L Daphnia magna EC50/48hr : 141mg/L
Persistence and Degardability	No information available on persistence/degradability for this product.
Mobility	No information available on mobility for this product. Soluble in water
Environmental Fate (Exposure)	Do NOT let product reach waterways, drains and sewers.
Bioaccumulative Potential	No information available on bioaccumulation for this product.

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility. Containers can be recycled after proper cleaning.
Special Precautions for Land Fill or Incineration	Contact a specialist disposal company or the local waste regulator for advice.

14. TRANSPORT INFORMATION

Land Transport (Australia)

Regulation Name	ADG

UN Number	Not applicable.
Shipping Name	POTASSIUM CHLORIDE
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	N/A
EPG	Not applicable.
Special Provision	Not applicable.

Sea Transport

Regulation Name	IMDG
UN Number	Not applicable.
Shipping Name	POTASSIUM CHLORIDE
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	No data available.
EPG	No data available.
Special Provision	Not applicable.

Air Transport

Regulation Name	IATA
UN Number	Not applicable.
Shipping Name	POTASSIUM CHLORIDE
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
Precaution for User	No data available.
Hazchem Code	No data available.
EPG	No data available.
Special Provision	Not applicable.

Land Transport (New Zealand)

Regulation Name	NZS5433
UN Number	Not applicable.
Shipping Name	POTASSIUM CHLORIDE
Dangerous Goods Class	Not applicable.
Subsidiary Risk	Not applicable.
Pack Group	Not applicable.
	No data available.

Precaution for User	N/A
Hazchem Code	Not applicable.
EPG	Not applicable.
Special Provision	

15. REGULATORY INFORMATION

Poisons Schedule	N/A
EPG	N/A
AICS Name	POTASSIUM CHLORIDE (KCl)
NZ Toxic Substance	N
HSNO Hazard Classification	6.1E 6.3B 6.4A 9.3B
ERMA Approval Code	HSR003261

16. OTHER INFORMATION

Literature References	No data available.
Sources for Data	No data available.

Legend to Abbreviations and Acronyms

<	less than
>	greater than
ADG	Australian Dangerous Goods Code
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstracts Service (Registry Number)
cm2	square centimetres
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
deg C ('C)	degrees Celsius
ERMA	Environmental Risk Management Authority
g	gram
g/cm3	grams per cubic centimetre
g/l	grams per litre
HSNO	Hazardous Substance and New Organism
IATA	International Air Transport Association Dangerous Goods Regulations
IDLH	Immediately Dangerous to Life and Health
IMDG	International Maritime Dangerous Goods Code
immiscible	liquids are insoluble in each other
kg	kilogram
kg/m3	kilograms per cubic metre
LC50	LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.

LD50	LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals
ltr	Litre
m3	cubic metre
mbar	millibar
mg	milligram
mg/24H	milligrams per 24 hours
mg/kg	milligrams per kilogram
mg/m3	milligrams per cubic metre
Misc	miscible
miscible	liquids form one homogeneous liquid phase regardless of the amount of either component present
mm	millimetre
mPa.s	milli Pascal per second
N/A	Not Applicable
NOHSC	National Occupational Health and Safety Commission
OECD	Organization for Economic Co-operation and Development
PEL	Permissible Exposure Limit
ppb	parts per billion
ppm	parts per million
ppm/2h	parts per million per 2 hours
ppm/6h	parts per millionper 6 hours
RCP	Reciprocal Calculation Procedure
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
tne	tonne
TWA	Time Weighted Average
ug/24H	micrograms per 24 hours
UN	United Nations (number)
wt	weight

Australia
Adelaide
Brisbane
Melbourne
Perth
Sydney

New Zealand
Auckland
Christchurch
Hawke's Bay

Sydney Office
2 Swettenham Road
Minto NSW 2566
Australia

telephone +61 2 97333000
facsimile +61 2 97333111
web www.redox.com
email info@redox.com

MATERIAL SAFETY DATA SHEET - SUACID

1. IDENTIFICATION

Revision Date	SEPTEMBER 2009
Product Name	SULPHAMIC ACID
Other Names	AMINOSULFURIC ACID; AMINOSULFONIC ACID; SULFAMIDIC ACID; AMIDOSULFURIC ACID; AMIDOSULFONIC ACID; IMIDOSULFONIC ACID.
Uses	Metal and ceramic cleaning, nitrite removal in azo dye operations, gas liberating compositions, organic synthesis, analytical acidimetric standard, amine sulphamates used as plasticizers and fire retardants, stabilizing agent for chlorine and hypochlorite in swimming pools, bleaching paper pulp/textiles, catalyst for urea-formaldehyde resins, sulphonating agent, pH control, hard water scale removal, and electroplating.

Contact Information

Organisation	**Location**	**Telephone**	**Ask For**
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61 2 97333000	Technical Officer
	11 Mayo Road Wiri Auckland 2104 New Zealand	+64 9 2506222	
Poison Information Centre	Westmead NSW Australia	131126	
Chemcall 24 Hour Emergency Number	Australia	1800-127406	
	New Zealand	0800-243622	
National Poisons Centre	New Zealand	0800-764766	

2. HAZARD IDENTIFICATION

Hazardous according to criteria of NOHSC/ASCC.

Dangerous According to the Australian Code for the Transport of Dangerous Goods.

Classified as Dangerous Goods According to NZS 5433:1999.

IRRITANT

Risk Phrases	R36/38	Irritating to eyes and skin.
	R52/53	Harmful to aquatic organisms; may cause long term adverse effects in aquatic environment.
Safety Phrases	S2	Keep out of reach of children.
	S24/25	Avoid contact with skin and eyes.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S28:SUACID	After contact with skin, wash immediately with plenty of soap and water.
	S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
	S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
	S61	Avoid release to the environment. Refer to special instructions/Material Safety Data Sheets.

ERMA New Zealand Approval Code	HSR001549
HSNO Hazard Classification	6.1D 8.1A 8.2C 8.3A 9.1C 9.3C

This Material Safety Data Sheet may not provide exhaustive guidance for all HSNO Controls assigned to this substance. The ERMA Web Site should be consulted for a full list of triggered controls and cited regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	**Chemical Entity**	**CAS Number**	**Proportions (%)**
	SULPHAMIC ACID	[5329-14-6]	99.5-100.0

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure.

Swallowed	Rinse mouth with water. Give water to drink provided victim is conscious. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Seek medical attention immediately.
Eye	If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing untill advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
Skin	If spilt on large areas of skin or hair, immediately drench with running water and remove contaminated 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. Wash clothing and shoes

	before reuse.
Inhaled	Remove victim from exposure to fresh air - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm and at rest. Seek medical advice if effects persist.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient. For severe exposures, monitor for delayed onset of pulmonary edema.
Aggravated medical conditions caused by exposure	No information available on medical conditions which are aggravated from exposure to this product.

5. FIRE FIGHTING MEASURES

Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions. Suitable media may include fine water spray, normal foam, dry agent such as carbon dioxide or dry chemical powder.
Hazards from Combustion Products	Non-combustible solid. Not considered to be a fire hazard. Not considered to be an explosion hazard. Avoid generating dust. Incompatible with oxidizing agents, strong bases, chlorine, hypochlorous acid, hypochlorites, cyanides, sulfides, nitrites, nitrates, carbonates, metal oxides, nitric acid, and sources of ignition. When involved in a fire this product may emit toxic fumes of ammonia, oxides of sulfur, oxides of nitrogen, and oxides of carbon.
Special Protective Precautions and Equipment for Fire Fighters	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit. Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Flammability Conditions	Product is a non-flammable solid.

Additional Information

Hazchem Code	2X

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures	Personnel involved in the clean up should wear full protective clothing. Avoid accidents, clean up immediately. Evacuate all unnecessary personnel. Increase ventilation. Avoid walking through spilled product as it is slippery when spilt. Stop leak if safe to do so. Isolate the danger area. Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management. Use clean, non-sparking tools and equipment. Shut off all possible sources of ignition. Avoid contact with humid air for the corrosive effect of its aqueous solution.
Methods and Materials for Containment and Clean Up	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to suitable, labelled, corrosion-resistant containers and dispose of promptly as hazardous waste.

7. HANDLING AND STORAGE

Precautions for Safe Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product vapours. Avoid prolonged or repeated exposure. Remove contaminated clothing and wash before reuse. Keep away from heat, flame, sparks, moisture, incompatibles, and foodstuffs. Keep out of reach of children. Keep containers dry at all times. Prevent moisture absorption (possibe caking). Empty containers of this material may be hazardous when empty since they retain product resdues. Observe all warnings for the product.
Conditions for Safe Storage (Including Any Incompatibles)	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Store away from foodstuffs. Keep away from heat, flame sparks, moisture, and sources of ignition. Keep out of reach of children. Keep containers dry at all times. Prevent moisture absorption (possibe caking). Empty containers of this material may be hazardous when empty since they retain product resdues. Observe all warnings for the product. This product has a UN classification of 2967 and a Dangerous Goods Class 8 (corrosive) according to The Australian Code for the Transport of Dangerous Goods by Road and Rail.
Container Type	Packaging must comply with requirements of Hazardous Substances (Packaging) Regulations 2001. Store in original packaging as approved by manufacturer. NOTE: Use corrosion-resistant containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These 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 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.
Biological Limit Values	No information available on biological limit values for this product.
Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection	RESPIRATOR: Wear an approved particulate respirator when handling this product (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: Chemical resistant gloves (AS2161). CLOTHING: Chemical resistant protective coveralls and safety footwear (AS3765/2210).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	White Crystals or Powder
Formula	H3NO3S
Odour	Odourless
Vapour Pressure	Not applicable.
Vapour Density	3.3
Boiling Point	Decomposes (408'C) deg C
Melting Point	200-205'C deg C
Solubility in Water	213g/L (20'C)
Specific Gravity	2.126 (Water = 1)
Flash Point	Not applicable.
pH	1.18 (1% Solution (25'C))
Lower Explosion Limit	Not applicable.
Upper Explosion Limit	Not applicable.
Ignition Temperature	Not applicable.
Specific Heat Value	Not applicable.
Particle Size	Not applicable.
Volatile Organic Compounds (VOC) Content	Not applicable.
Evaporation Rate	Not applicable.
Viscosity	Not applicable.
Percent Volatile	0%
Octanol/Water partition coefficient	Not applicable.
Saturated Vapour Concentration	Not applicable.
Additional Characteristics	Not applicable.
Flame Propagation/Burning Rate of Solid Materials	Not applicable.
Properties of Materials That May Initiate or Contribute to Fire Intensity	Not applicable.
Potential for Dust Explosion	Not applicable.

Reactions that Release Flammable Gases	Not applicable.
Fast of Intensely Burning Characteristics	Not applicable.
Non-flammables That Could Contribute Unusual Hazards to a Fire	Not applicable.
Release of Invisible Flammable Vapours and Gases	Not applicable.
Decomposition Temperature	209'C
Additional Information	Molecular Weight: 97.1g/mol Solubility : 213g/L, in H_2O (20'C) 470g/L, in H_2O (80'C) pH (25'C) : 1.1 at 0.15 moles/L 0.6 at 0.50 moles/L

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature. Corrosive Solid. Solutions are acidic. In water, solution slowly hydrolyses to form ammonium sulfate and bisulfate.
Conditions to Avoid	Avoid excessive heat, elevated temperatures, sparks, flame, sources of ignition, dust generation, moisture/high humidity, avoid heating above decomposition point, avoid storage with strong acid and strong oxidising agents.
Incompatible Materials	Incompatible with oxidizing agents, strong bases, chlorine, hypochlorous acid, hypochlorites, cyanides, sulfides, nitrites, nitrates, carbonates, metal oxides, nitric acid, and sources of ignition.
Hazardous Decomposition Products	When involved in a fire this product may emit toxic fumes of ammonia, oxides of sulfur, oxides of nitrogen, and oxides of carbon.
Hazardous Reactions	Hazardous polymerization will not occur. Attacks metals in the presence of moisture.

11. TOXICOLOGICAL INFORMATION

Toxicity Data	Oral LD50 Rat : >3000mg/Kg Oral LD50 Rat : 3160mg/Kg Oral LD50 Mouse : >1000mg/Kg Oral LD50 Mouse : 1312mg/Kg Oral LD50 Guinea Pig : 1050mg/Kg Irritation Data, Skin, Human: Standard Draize Test: 4%/5days-I mild. Skin, Rabbit: Standard Draize Test: 500mg/24hr severe. Eye, Rabbit: Standard Draize Test: 250ug/24hr severe.

Health Effects - Acute

Swallowed	Corrosive. Swallowing may result in nausea, vomiting, diarrhoea,

	abdominal pain, and chemical burns to the gastrointestinal tract. Swallowing may cause severe ere burns of the mouth, throat and stomach, leading to death.
Eye	Causes eye irritation. May cause blurred vision, redness, pain and severe tissue burns and eye damage.
Skin	Irritating to skin. Corrosive. Contact with skin will result in irritation with redness, pain and possible severe burns and stains.
Inhaled	Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation due to severe mucous membrane irritation, coughing, choking, headache, dizziness, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. May cause pulmonary oedema, a medical emergency. Pulmonary oedema may be delayed for up to 48 hours.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Harmful effect on aquatic organisms, may cause long-term adverse effects in the aquatic environment. Sulfamic Acid solution is a strong acid, so it changes pH of the water in the limit volume very quickly and ruins the ecological environment. pH of Sulfamic Acid solution at 25'C is as follows: CONCENTRATION: pH: 1.00N 0.41 0.75N 0.50 0.50N 0.63 0.25N 0.87 0.10N 1.18 0.05N 1.41 0.01N 2.02
Persistence and Degardability	No information available on persistence/degradability for this product.
Mobility	No information available on mobility for this product. Soluble in water.
Environmental Fate (Exposure)	Do NOT allow product to enter waterways, drains or sewers.
Bioaccumulative Potential	No information available on bioaccumulation for this product.

13. DISPOSAL CONSIDERATIONS

Disposal	Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/ reconditioned at an approved facility.
Special Precautions for Land Fill or Incineration	Contact a specialist disposal company or the local waste regulator for advice. This should be done in accordance with 'The Hazardous Waste Act'.

14. TRANSPORT INFORMATION

Land Transport (Australia)

Regulation Name	ADG
UN Number	2967
Shipping Name	SULPHAMIC ACID

Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	III
Precaution for User	IRRITANT
Hazchem Code	2X
EPG	37 TOXIC AND/OR CORROSIVE SUBSTANCES Non-Combustible
Special Provision	Not applicable.

Sea Transport (New Zealand)

Regulation Name	IMDG
UN Number	2967
Shipping Name	SULPHAMIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	III
Precaution for User	IRRITANT
Hazchem Code	2X
EPG	37 TOXIC AND/OR CORROSIVE SUBSTANCES Non-Combustible
Special Provision	Not applicable.

Air Transport

Regulation Name	IATA
UN Number	2967
Shipping Name	SULPHAMIC ACID
Dangerous Goods	8 Corrosive Substance
Subsidiary Risk	

Class	Not applicable.
Pack Group	III
Precaution for User	IRRITANT
Hazchem Code	2X
EPG	37 TOXIC AND/OR CORROSIVE SUBSTANCES Non-Combustible
Special Provision	Not applicable.

Land Transport (New Zealand)

Regulation Name	NZS5433
UN Number	2967
Shipping Name	SULPHAMIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	III
Precaution for User	IRRITANT
Hazchem Code	2X
EPG	37 TOXIC AND/OR CORROSIVE SUBSTANCES Non-Combustible
Special Provision	Not applicable.

Land Transport (Papua New Guinea)

Regulation Name	NZS5433
UN Number	2967
Shipping Name	SULPHAMIC ACID
Dangerous Goods Class	8 Corrosive Substance
Subsidiary Risk	Not applicable.
Pack Group	

	III
Precaution for User	IRRITANT
Hazchem Code	2X
EPG	37 TOXIC AND/OR CORROSIVE SUBSTANCES Non-Combustible
Special Provision	Not applicable.

15. REGULATORY INFORMATION

Poisons Schedule	6
EPG	37
AICS Name	SULFAMIC ACID
NZ Toxic Substance	N
HSNO Hazard Classification	6.1D 8.1A 8.2C 8.3A 9.1C 9.3C
ERMA Approval Code	HSR001549

16. OTHER INFORMATION

Literature References	No data available.
Sources for Data	No data available.

Legend to Abbreviations and Acronyms

<	less than
>	greater than
ADG	Australian Dangerous Goods Code
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstracts Service (Registry Number)
cm2	square centimetres
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
deg C ('C)	degrees Celsius
ERMA	

	Environmental Risk Management Authority
g	gram
g/cm3	grams per cubic centimetre
g/l	grams per litre
HSNO	Hazardous Substance and New Organism
IATA	International Air Transport Association Dangerous Goods Regulations
IDLH	Immediately Dangerous to Life and Health
IMDG	International Maritime Dangerous Goods Code
immiscible	liquids are insoluble in each other
kg	kilogram
kg/m3	kilograms per cubic metre
LC50	LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50	LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals
ltr	Litre
m3	cubic metre
mbar	millibar
mg	milligram
mg/24H	milligrams per 24 hours
mg/kg	milligrams per kilogram
mg/m3	milligrams per cubic metre
Misc	miscible
miscible	liquids form one homogeneous liquid phase regardless of the amount of either component present
mm	millimetre
mPa.s	milli Pascal per second
N/A	Not Applicable
NOHSC	National Occupational Health and Safety Commission
OECD	Organization for Economic Co-operation and Development
PEL	Permissible Exposure Limit
ppb	parts per billion
ppm	parts per million
ppm/2h	parts per million per 2 hours
ppm/6h	parts per millionper 6 hours
RCP	Reciprocal Calculation Procedure
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
tne	tonne
TWA	Time Weighted Average
ug/24H	micrograms per 24 hours

UN	United Nations (number)
wt	weight

Australia	New Zealand	Sydney Office		
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Brisbane	Christchurch		facsimile	+61 2 97333111
Melbourne	Hawke's Bay		web	http://www.redox.com/
Perth			email	mailto:info@redox.com?subject=MSDS%20for%20SULPHAMIC%20ACID
Sydney				

This MSDS summarises Redox Pty Ltd best knowledge of the health and safety hazard information of the selected substance and how to safely handle the selected substance in the workplace however Redox Pty Ltd expressly disclaims that the MSDS is a representation or guarantee of the chemical specifications for the substance.

Each user should read the MSDS and consider the information in the context of how the selected substance will be handled and used in the workplace including its use in conjunction with other substances.

RHEOCHEM

MATERIAL SAFETY DATA SHEET

Product Name XANVIS (RHEOCHEM)

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Supplier Name	**RHEOCHEM LTD**
Address	11 Alacrity Place, Henderson, WA, AUSTRALIA, 6166
Telephone	+61 8 9410 8200
Fax	+61 8 9410 8299
Emergency	1800 127 406 (Australia); 011 64 3 3530199 (International)
Web Site	http://www.rheochem.com.au/
Synonym(s)	XANTHUM GUM
Use(s)	DRILLING FLUID ADDITIVE • VISCOSITY MODIFIER
SDS Date	01 Nov 2010

2. HAZARDS IDENTIFICATION

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE

UN No.	None Allocated	**DG Class**	None Allocated	**Subsidiary Risk(s)**	None Allocated
Packing Group	None Allocated	**Hazchem Code**	None Allocated		

3. COMPOSITION/ INFORMATION ON INGREDIENTS

Ingredient	Formula	CAS No.	Content
GLYOXAL	C2-H2-O2	107-22-2	<1%
XANTHAN GUM	Not Available	11138-66-2	>60%

4. FIRST AID MEASURES

Eye	If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.
Inhalation	If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.
Skin	If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.
Ingestion	For advice, contact a Poison Information Centre on 13 11 26 (Australia Wide) or a doctor (at once). If swallowed, do not induce vomiting. Ingestion is considered unlikely due to product form.
Advice to Doctor	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flammability	Combustible. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Finely divided dust may form explosive mixtures with air.
Fire and Explosion	Evacuate area and contact emergency services. Toxic gases may be evolved in a fire situation. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.
Extinguishing	Dry agent, carbon dioxide, foam or water fog. Prevent contamination of drains or waterways.

6. ACCIDENTAL RELEASE MEASURES

Spillage	Contact emergency services where appropriate. Use personal protective equipment. Clear area of all unprotected personnel. Prevent spill entering drains or waterways. Contain spillage, then collect and place in suitable containers for reuse or disposal. Avoid generating dust.

7. STORAGE AND HANDLING

Storage	Store in a cool, dry, well ventilated area, removed from oxidising agents, acids and foodstuffs. Ensure containers are adequately labelled.
Handling	Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

Exposure Stds	No exposure standard(s) allocated.
Biological Limits	No biological limit allocated.
Engineering Controls	Avoid inhalation. Use in well ventilated areas. Maintain dust levels below the recommended exposure standard.
PPE	Wear dust-proof goggles and PVC or rubber gloves. When using large quantities or where heavy contamination is likely, wear: coveralls. Where an inhalation risk exists, wear: a Class P1 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	WHITE POWDER	**Solubility (water)**	SOLUBLE
Odour	SLIGHT ODOUR	**Specific Gravity**	1.5
pH	7 (Approximately)	**% Volatiles**	NOT AVAILABLE
Vapour Pressure	NOT AVAILABLE	**Flammability**	COMBUSTIBLE
Vapour Density	NOT AVAILABLE	**Flash Point**	NOT AVAILABLE
Boiling Point	NOT AVAILABLE	**Upper Explosion Limit**	NOT AVAILABLE
Melting Point	NOT AVAILABLE	**Lower Explosion Limit**	NOT AVAILABLE
Evaporation Rate	NOT AVAILABLE		

10. STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended conditions of storage.
Conditions to Avoid	Avoid heat, sparks, open flames and other ignition sources.
Material to Avoid	Incompatible with oxidising agents and acids (eg. nitric acid).
Hazardous Decomposition Products	May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.
Hazardous Reactions	Polymerization is not expected to occur.

11. TOXICOLOGICAL INFORMATION

Health Hazard Summary	Low toxicity. Under normal conditions of use, adverse health effects are not anticipated. This product is generally considered to be of low toxicity. Use safe work practices to avoid eye contact, prolonged skin contact and dust generation - inhalation.
Eye	Low to moderate irritant. Contact may result in irritation, lacrimation, pain and redness.
Inhalation	Low irritant. Over exposure may result in irritation of the nose and throat, with coughing.
Skin	Low irritant. Prolonged or repeated contact may result in mild irritation.
Ingestion	Low toxicity. Ingestion may result in gastrointestinal irritation. However, due to product form ingestion is considered unlikely. Maintain good personal hygiene standards.
Toxicity Data	GLYOXAL (107-22-2) LD50 (Ingestion): 200 mg/kg (rat) LD50 (Intraperitoneal): 200 mg/kg (mouse) LD50 (Skin): 6600 mg/kg (guinea pig)

12. ECOLOGICAL INFORMATION

Environment	This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. Not expected to bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Waste Disposal	Ensure product is covered with moist soil to prevent dust generation and dispose of to approved Council landfill. Contact the manufacturer if additional information is required.
Legislation	Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE

Shipping Name	None Allocated				
UN No.	None Allocated	**DG Class**	None Allocated	**Subsidiary Risk(s)**	None Allocated
Packing Group	None Allocated	**Hazchem Code**	None Allocated		

15. REGULATORY INFORMATION

Poison Schedule	A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).
AICS	All chemicals listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

Additional Information

RESPIRATORS: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

ABBREVIATIONS:
ACGIH - American Conference of Industrial Hygienists.
ADG - Australian Dangerous Goods.
BEI - Biological Exposure Indice(s).
CAS# - Chemical Abstract Service number - used to uniquely identify chemical compounds.
CNS - Central Nervous System.
EC No - European Community Number.
HSNO - Hazardous Substances and New Organisms.
IARC - International Agency for Research on Cancer.
mg/m3 - Milligrams per Cubic Metre.
NOS - Not Otherwise Specified.
pH - relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm - Parts Per Million.
RTECS - Registry of Toxic Effects of Chemical Substances.
STEL - Short Term Exposure Limit.
SWA - Safe Work Australia.
TWA - Time Weighted Average.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a Chem Alert report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this Chem Alert report is provided as a guide only. Factors such as method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

Report Status

This document has been compiled by RMT on behalf of the manufacturer of the product and serves as the manufacturer's Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

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SDS Date 01 Nov 2010

End of Report