



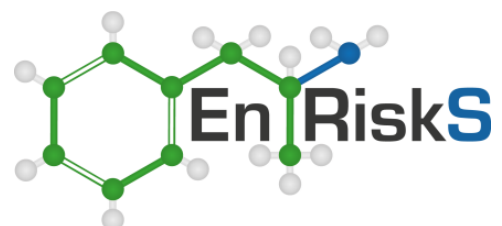
Appendix D Human Health and Ecological Risk Assessment – Drilling Chemicals

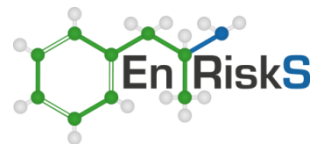


Human Health and Ecological Risk Assessment – Drilling Chemicals

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) of drilling chemicals used in the Camden Gas Project, New South Wales (NSW).

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 drilling 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 in drilling, 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 drilling 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 drilling 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:

- Chemical and physical properties – evaluated in conjunction with other as outlined aspects 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 and 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 permanent disability and require a high level of PPE, monitoring and management	Chemical is mobile, persistent, has the potential for low to moderate bioaccumulation in aquatic species or food chain	Permanent health effects that require extended medical treatment and/or permanent disability	High potential for adverse effects on aquatic ecosystem
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 drilling 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 drilling 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 drilling 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
			very likely	likely	possible	unlikely	highly unlikely
Likelihood of Exposure at Receptor ↑	Confirmed connection between coal seam and receiving environment, confirmed use of aquifer or direct discharge to environment/ecosystem	5	N	L	M	H	E
	Likely connection between coal seam and receiving environment, potential use of aquifer or discharge to local environment/ecosystem	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)	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	2	N	L	L	L	L
	No connection between coal seam and receiving environment and management measures in place to prevent surface spills	1	N	N	N	N	N

The overall risk outcomes have been determined as follows:

Table 5 Risk Outcomes

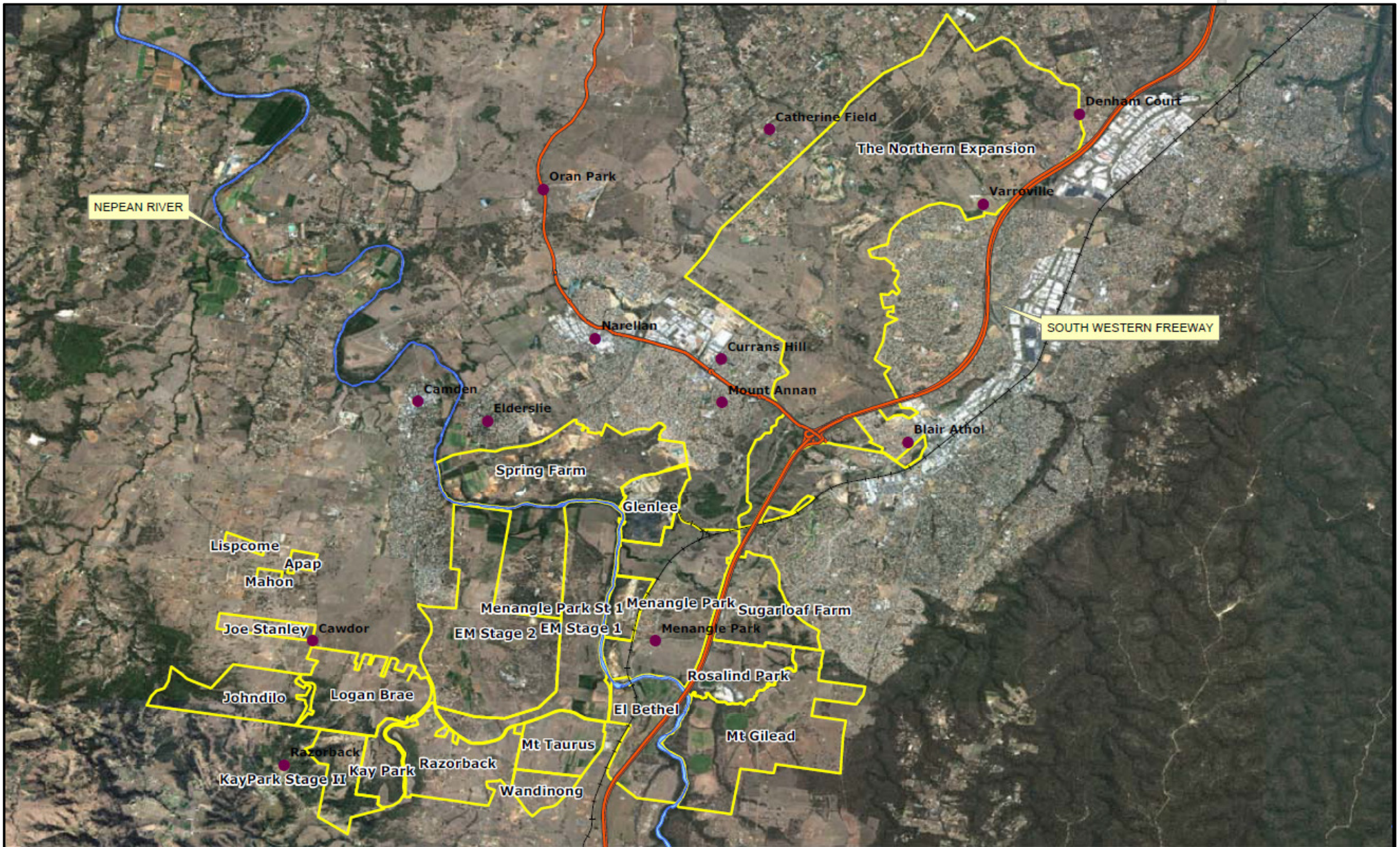
Rank	Description
N	Negligible risk - no adverse impacts
L	Low risk - potential for impacts is very low and potential for impacts to result in adverse effects is low. Risk issues identified can be effectively managed through implementation of appropriate management measures.
M	Medium risk - risk considered 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 health 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 km². The Georges River catchment covers nearly 1,000 km², 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).



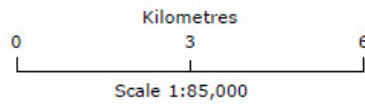
Energy in action™

AGL

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

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

Camden Gas Project Stages
Figure 1



Geocentric Datum of Australia 1994

Sources: AGL Energy Limited, MapData Sciences, SKM

Legend

- Towns
- Major Highway
- +— Railway Line
- ▭ Neapean River
- ▭ Camden Gas Project



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 m³/tonne and can be as high as 25 m³/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. 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 (lower) 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 typically 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.

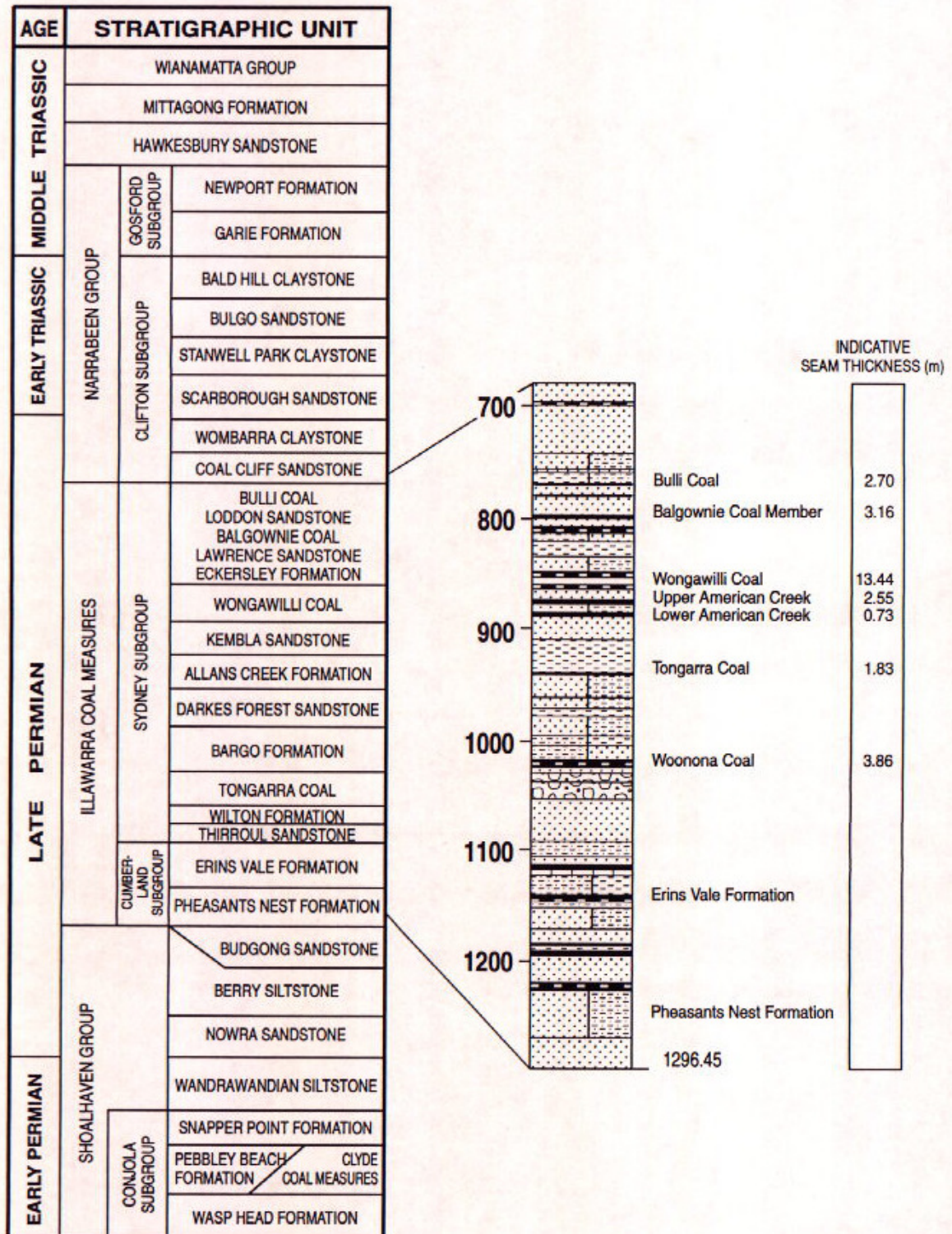


Figure 2 Stratigraphy of Southern Sydney Basin (from Geological Survey of NSW, 1996)

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. 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.

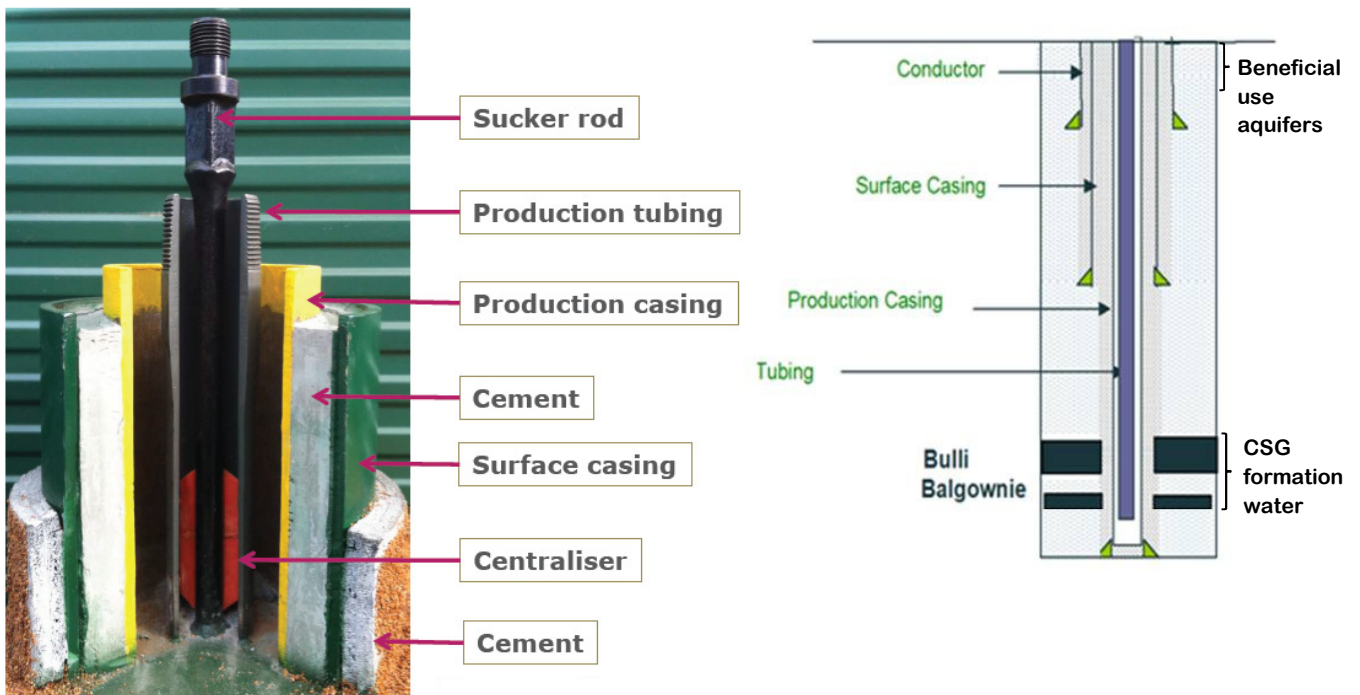


Figure 3 Typical Well Construction (from AGL)

2.2 Potential Impact of Drilling Activities

The focus of this report is on the potential for chemicals used in drilling 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 drilling activities and are not further evaluated in this assessment.

Table 6 Summary of Potential Impacts and Likelihood - Drilling 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 drilling 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 drilling 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 drilling fluids/chemicals, may result in exposures by workers and/or runoff to the adjacent environment (terrestrial or local aquatic environments where present)	1	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 cater for rainfall or 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 viscosity of drilling fluids is relatively high and hence it will not rapidly flow across the ground, allowing sufficient time for effective remediation of any spill prior to entry into the environment.

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

On the basis of the above, the only pathways by which chemicals used in drilling 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. 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 drilling 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.

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 drilling operations.

3.2 Chemical Information

To assist in the evaluation of the potential for the chemicals used in drilling 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 drilling activities (included in **Appendix B**);
- Hazardous Substances Databank (HSDB), accessed in February 2013;
- 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 drilling 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:

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

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

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 drilling 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 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 drilling 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**.

Characterisation of Potential Risk

The potential for risks to be of concern has been evaluated on the basis of the following:

- The handling of chemicals prior to use in drilling activities has been assessed on the basis of potential workplace health and safety risks using the risk ranking as presented in **Table 1**. This evaluation identified chemicals that require additional personal protective equipment (PPE) and care to ensure workers who use the chemicals above-ground are adequately protected.

- In the event of a spill above-ground, the potential for adverse human health and environmental risks has been assessed using a worst-case approach assuming that the maximum concentrations present in the drilling fluid are present in an area where exposure by humans (in drinking water) or the environment may occur, and there is no dilution of the concentrations in any other water body or degradation of any chemicals. This worst-case assessment has been undertaken by calculating a Hazard Index (HI) using the following equations:

$$HI(\text{human health}) = \frac{\text{concentration in drilling fluid}}{\text{drinking water quality guideline}}$$

$$HI(\text{environmental}) = \frac{\text{concentration in drilling fluid}}{\text{water quality guideline or Tox(eco)}}$$

This calculation has been undertaken to enable a ranking of the potential worst-case consequences of effects should a spill occur (and there is no dilution or degradation).

The final ranking of a human health or environmental hazard has been undertaken on a qualitative basis and has considered the calculated HI as well all available information in relation to the nature of the adverse effects identified following exposure, and the potential for such exposures to occur over a long period of time (i.e. more than a year where the exposure is considered to be chronic) based on the behaviour of the chemical once it is in the environment. This is important as most of the human health and ecological guidelines adopted are based on chronic (long-term) exposures to these chemicals.

The final risk ranking has then been determined on the basis of the consequences as outlined in **Table 1**.

- Evaluation of potential risks based on the consequences (as calculated above) and likelihood of the event (connection between groundwater aquifers or a spill) occurring (based on the likelihood descriptors as outlined in **Table 2**). This evaluation takes into account policies and procedures adopted by AGL in the conduct of all aspects of drilling activities and utilises the risk matrix as described in **Table 4**.

3.3 Summary of Chemical Reviews

3.3.1 General

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 drilling activities that are insoluble solids where the only hazard relates to occupational exposures during use. These products include crystalline quartz, Portland and blended cement, bentonite and the product WA-131 which is a blend of inhibitive and non-corrosive salts. 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.

3.3.2 Occupational Assessment of Hazard

Based on the available data **Table 7** presents a summary of the drilling chemicals that are ranked from 1 (negligible) to 4 (high) and require varying levels of PPE to ensure occupational exposures are appropriately addressed.

Table 7 Summary of Occupational Hazard Analysis of Chemicals used in Drilling Activities

Compound	Occupational Hazard Ranking
Moderate to High Hazards – Transient to permanent health effects that may require medical treatment (or disability) and require moderate to high level of PPE, monitoring and management	
Moderate Hazards – Transient effects that may require medical attention and include respiratory and more significant irritation effects that need to be managed with moderate level PPE.	
Tetrakis(hydroxymethyl)phosphonium sulphate [THPS]	3-4
Low to Moderate Hazards – minor nuisance effects including low level irritation that requires to low level PPE to more transient effects that may require medical attention and include respiratory and more significant irritation effects that need to be managed with moderate level PPE	
Barium sulfate	3
Benzalkonium chloride	3
Negligible to Low Hazards – low to minor nuisance effects including low level irritation that may require low level PPE	
Xanthan gum	2
Potassium chloride	2
Sodium carbonate	2
Cellulose fibres	2
Starch	2
Calcium chloride	2
Amine polymer derivative	1-2

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

3.3.3 Human Health and Environmental Hazard Assessment

In relation to hazards to human health and the environment in the event that drilling fluids containing the chemicals evaluated is spilled at the ground surface (prior to injection into the well), a worst-case assessment of potential hazards has been undertaken based on potential impacts to human health (non-occupational) and the environment. This has been undertaken following the approach outlined in **Section 3.2**.

The detailed information relevant to each chemical considered is summarised in **Appendix A. Table 8** presents a summary of key ranking and quantitative values presented in **Appendix A** as well as the calculated HI for human health and environmental hazards. It is noted that the HI calculated for human health and environmental hazards is a worst-case calculation relevant to potential exposure that may occur prior to any dilution, sorption to soil/sediments or degradation in the environment.

Table 8 Summary of Human Health and Environmental Hazard Analysis of Chemicals used in Drilling Activities – Based on Chemicals at Point of Injection

Compound	Concentration in drilling fluid before injection in well (mg/L)	Potential for Off-Site Migration (fate and transport in environment)	Human Health Evaluation – Worst-case			Ecological Health Evaluation – Worst-case		
			Drinking Water Guideline (mg/L)	HI	Hazard Ranking	Water Quality Guideline ^T (mg/L)	HI	Hazard Ranking
Sodium carbonate	450	2	Based on pH	--	1-2	Based on pH	--	2-3
Xanthan gum	3000	1	NA	--	1	NA	--	1
Starch	5	1-2	NA	--	1	>10	<0.5	1
Tetrakis(hydroxymethyl)phosphonium sulfate	100	2	0.126	790	4	0.67 to 67.4	134 to 1.3	4
Benzoalkonium chloride	75	2	0.1	750	4	0.0004	>10000	4
Potassium chloride	NA*	1-2	6.4		1	>100		1
Cellulose fibre	NA*	1	NA	--	1	Based on pH	--	1
Barite sulfate	NA*	1-2	2 (soluble species)	--	2	>30 mg/L	--	2
Calcium chloride	2-3%	2	NA	--	1	>1000 mg/L	<20	1-2
Amine polymer derivative	NA*	2	NA	--	2	60-100 mg/L	--	3

Notes:

Refer to **Appendix A** for more detail on each chemical and explanations on the basis for the risk ranking selected for fate and transport in the environment, human health and environmental hazards.

* = Actual concentration not known as use will only be as required

T = range of concentrations based on the range of data available from relevant ecotoxicological studies considered as Tox(eco) values (refer to **Appendix A** for further details on these values).

NA = not applicable on the basis of the following reasons:

- The only effects identified relate to the pH of the chemical (acid or alkali) and hence there are no quantitative human health or ecological values that are based on a concentration of the chemical in water. No HI can be calculated. The ranking of risk has therefore been undertaken on a qualitative basis as presented in **Appendix A**.
- The compound is not toxic to humans and/or the environment at any dose in all the studies undertaken. Hence there are no quantitative values that can be used to calculate a HI.

On the basis of **Table 8**, in the event that drilling fluid were spilled at the ground surface and were released into the environment the following presents a summary of the chemicals that have been identified to pose a high to negligible risk to human health (non-occupational) or the environment.

Table 9 Summary of Human Health and Environmental Hazard Rankings for Drilling Chemicals (in the event of surface spill)

Consequence Descriptor	Off-Site Impacts to Human Health	Off-Site Impacts to the Ecosystem
Negligible (1)	No adverse long-term health effects associated with low level environmental exposures:	Negligible potential for adverse effects on aquatic ecosystem:
	Xantham gum Potassium chloride Cellulose fibre Starch	Xantham gum Potassium chloride Cellulose fibre Starch
Low (1-2 and 2)	Minor transient health effects or odour:	Low potential for adverse effects on aquatic ecosystem:
	Sodium carbonate Barite sulfate	Barite sulphate Calcium chloride
Moderate (2-3 and 3)	Transient effects that may require medical treatment such as respiratory effects, more significant irritation:	Moderate potential for adverse effects on aquatic ecosystem:
		Sodium carbonate Amine polymer derivative
High (3-4 and 4)	Permanent health effects that require extended medical treatment and/or permanent disability:	High potential for adverse effects on aquatic ecosystem:
	Tetrakis(hydroxymethyl)phosphonium sulfate Benzoalkonium chloride	Tetrakis(hydroxymethyl)phosphonium sulfate Benzoalkonium chloride

Review of **Tables 8 and 9** indicates that most of the chemicals utilised in drilling operations are associated with negligible to low/moderate hazards to human health and/or the environment. There are some chemicals that are of greater concern (sodium carbonate [due to high pH] and Tetrakis(hydroxymethyl)phosphonium sulfate) should they be released directly to an environment (where they may be present in undiluted drilling fluids) where exposure may occur. The overall risk of the use of these chemicals depends not only on these hazards, but the likelihood that exposure may occur. This is further discussed in the following section.

Section 4 Risk Characterisation/Assessment

The evaluation of potential risks associated with the use of chemicals in drilling 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 drilling activities;
- the likelihood that chemicals used in drilling 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 **Tables 7 to 9**).

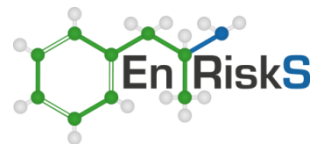
While a range of hazards have been identified in relation to the behaviour of the evaluated chemicals in the environment, occupational/acute hazards, chronic health effects and ecological impacts, the likelihood that any of these chemicals may be discharged into an environment where any level of exposure 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). These evaluations are summarised on the risk matrix presented in **Table 10** (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 drilling 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.

Table 10 Summary of Overall Risk Ranking for Chemicals used in Drilling 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 – Drilling Chemicals

Chemical summaries for chemicals identified Drilling 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		Xanthan Gum	
Proposed concentration	up to 3000 mg/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.m ³ /mol at 20-25oC)	NA		
Volatility potential	Soil: no Water: no		
Log Kow	NA		
Koc	NA		
Comments	Xanthan 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 Xanthan gum the potential for discharge to a receiving environment is considered to be negligible		1
Human Health			
General	Xanthan 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/m ³)	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

Compound		Xanthan Gum	
Chronic Effects		Evaluation of Xanthan 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 Xanthan 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 2013)

S = occupational guidelines available from Safework Australia (retrieved February 2013)

Compound		Tetrakis(hydroxymethyl)phosphonium sulfate [THPS]	
Proposed concentration in hydraulic fracturing fluid (mg/L)		100 (approx.)	AGL
MSDS Available		yes	
Listed on AICS		yes	
NICNAS		Not assessed	
CAS No.		55566-30-8	M
Molecular Formula		C ₈ H ₂₄ O ₁₂ P ₂ S	H
Colour/ Form		colourless or yellowish liquid	M
Odour/ Taste		extremely sharp, acrid pungent odour	M
Odour Threshold		0.98ppm	M
Corrosive		Considered corrosive	M
Irritation		Severe irritation to eyes and may cause skin irritation. May cause skin sensitisation (allergic reaction)	M
Stability		Stable under normal storage and handling conditions. Decomposes at temperatures above 160°C	M
Incompatibility		Oxidizing agents, acids, bases and reducing agents	M
Solubility		Soluble in ethanol, ether, acetone; slightly soluble in chloroform, soluble in oxygenated solvents, miscible with lower alcohols, ketones, benzene, diethyl ether	
Solubility (mg/L in water (20-25°C))		NA	
Molecular weight		406.28	H
pH		3-6	M
Vapour Pressure (mmHg at 20-25°C)		26.7	C
Density		1.38 g/mL (75% product)	C
Vapour Density (air = 1)		1.94	H
Henry's Law (atm.m³/mol at 20-25°C)		1.76x10 ⁻¹⁴	C
Volatility potential	Soil	very low	
	Water	very low	
Log Kow		<0	H
Koc		2.2	H
Soil Adsorption/ Mobility		Limited potential for sorbtion to soil, organic matter or sediments. If remaining in the environment this compound will be mobile	C
Potential for bioaccumulation (BCF)		No	M, C
Degradation potential	Soil	High	C
	Water	Data suggests the compound biodegrades under aerobic and anaerobic conditions. Rapidly mineralised to CO ₂ in aquatic environment. May produce low concentrations of degradation products	M, C
Ranking - Fate and Transport		Overall, if released into the environment, this compound does not sorb to solid particles in the water column and is mobile, is mineralised to carbon dioxide and is not bioaccumulative in aquatic species or the food chain, on this basis the potential for discharge of this compound to a receiving environment is considered to be low.	2

Compound		Tetrakis(hydroxymethyl)phosphonium sulfate [THPS]	
Human Health			
General		Health effects from exposure to this compound are principally associated with acute exposures in occupational environments.	H
Acute Effects		The product has been shown to be highly acutely toxic via the oral route, of low toxicity via the dermal route, and of moderate toxicity via the inhalation route. It is considered to be corrosive to the eye and has been shown to be a dermal sensitiser. The product was also considered to be irritating to the skin.	H
Occupational Inhalation Guidelines (mg/m3)	TWA	2	ACGIH
	STEL	3 times TWA for no more than 30 minutes and under no circumstances more than 5 times TWA	ACGIH
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		In short- and long-term oral animal studies, the liver has been identified as the primary target organ of toxicity for exposure to tetrakis (hydroxymethyl) phosphonium sulphate. Other health effects associated with chronic exposures, derived from animal studies, include effects on the liver, lung, testes, uterus and bone marrow, as well as lymphoid depletion of spleen and thymus. Some animals died when high doses of tetrakis (hydroxymethyl) phosphonium sulphate were given, or when higher doses of tetrakis (hydroxymethyl) phosphonium sulphate was given for longer periods of time. There is no indication that tetrakis (hydroxymethyl) phosphonium sulphate caused damage to the nervous system. Developmental effects have been reported in animals, but only at doses that are also toxic to the mother, which suggests that the foetus is not more sensitive to tetrakis (hydroxymethyl) phosphonium sulphate than the adult animal.	W
		Review by Health Canada (2010) considered data from chronic rat and mouse studies 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.	

Compound		Tetrakis(hydroxymethyl)phosphonium sulfate [THPS]	
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	15 to 18 mg/kg bw/day based on maternal toxicity derived from a developmental study on rats and rabbits	C, M
	DWGp	0.126 mg/L based on lowest NOAEL and equation in report	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be high due to the potential for carcinogenic and genotoxic effects and the potential for concentrations in hydraulic fracturing fluids to be higher than the DWGp	4
Ecological			
	General	Limited data is available in relation to ecotoxicological data for THPS. Given that tetrakis (hydroxymethyl) phosphonium sulphate is an algaecide and slimicide, it is expected to adversely affect algae. Tetrakis (hydroxymethyl) phosphonium sulphate negatively affects biomass of the freshwater green algae at concentrations of 0.063 mg/L. LC50 ranges from 93 to 119 mg/L, EC50 ranges from 0.06 to 24 mg/L. Toxicity considered to be high.	M,H,C
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
	Tox(eco)	0.06 – 24 mg/L (based on range of EC50 and LC50)	
Published Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		The most sensitive adverse effect associated with the release of tetrakis (hydroxymethyl) phosphonium sulphate into an aquatic environment is on algae. Other species are less sensitive to exposures to this compound, however the presence of algae in the aquatic ecosystem can be an important source of food for other species. Hence the protection of algae is of importance. On the basis of the available information the potential for adverse effects to aquatic ecosystems has been ranked as high	4

C = Health Canada, 2010. Tetrakis (Hydroxymethyl) Phosphonium Sulfate, Evaluation Report ERC2010-02. Health Canada, 17 February 2010

WHO 2000. Environmental Health Criteria 218, Flame Retardants: Tris(2-Butoxyethyl)phosphate, Tris(2-ethylhexyl)phosphate and Tetrakis(hydroxymethyl)phosphonium salts

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		Potassium Chloride	
Proposed concentration	Actual concentration not known as use will only be as required (potential concentration of 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 Water	Will dissociate readily to potassium and chloride ions.	OECD
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 administered 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	
	NOAEL	1820 mg/kg/day for repeated dose exposures, based on study in rats	OECD
	DWGP	6.4 mg/L based on equation in report	
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 2013)

S = occupational guidelines available from Safework Australia (retrieved February 2013)

Compound		Barite sulfate (barium sulfate)	
Proposed concentration (mg/L)	Actual concentration not known as use will only be as required		AGL
MSDS Available	yes		
Listed on AICS	yes		
NICNAS	Not assessed, but listed on High Volume Industrial Chemicals List in 2002 and 2006		
CAS No.	7727-43-7		M
Molecular Formula	H ₂ O ₄ SBa		H
Colour/ Form	fine, heavy powder or polymorphous crystals		H
Odour/ Taste	odorless and tasteless		H
Odour Threshold	NA		M
Corrosive	No		M
Explosive	No		M
Irritation	Potential irritant of eye, nose and respiratory tract		M
Stability	Stable		M
Incompatibility	None		M
Solubility	Soluble in hot sulfuric acid		
Solubility (mg/L in water (20-25oC))	Practically insoluble, does not mix, sinks in water		H
Molecular weight	233.39		H
pH	<2 (1% solution)		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	not volatile	
	Water	not volatile	
Log Kow	NA		
Koc	NA		
Soil Adsorption/ Mobility	Barium salts are naturally present in soil. Colloidal clays have been found to decompose insoluble barium sulfate by binding barium. Barium in soil is not mobile due to formation of insoluble salts.		H
Potential for bioaccumulation (BCF)	Limited (as barium sulfate)		H
Degradation potential	Soil	low	H
	Water	low	H
Ranking - Fate and Transport	Barium compounds are not very mobile in the environment as the form used is not considered soluble and would remain bound to soil. The compound does not accumulate in plants. There is some potential for some forms of barium to accumulate in aquatic species, however barium sulfate is expected to remain as an insoluble precipitate where it is less bioavailable.		1-2

Compound		Barite sulfate (barium sulfate)	
Human Health			
General		Barium sulfate is an insoluble barium compound where the available data has shown limited toxicity. Insufficient data are available on barium sulfate to develop quantitative toxicological criteria and guidelines and hence these are developed based on soluble barium compounds.	H
Acute Effects		Barium sulfate is generally considered a non-toxic dust, however exposures to high levels have caused benign pneumoconiosis (baritosis). Occupational exposure levels have been determined to be protective of these and other respiratory, eye and nose irritation.	M
Occupational Inhalation Guidelines (mg/m³)	TWA	10	S
	STEL	NA	S
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. PPE is also required for the presence of crystalline silica also present in the product.	3
Chronic Effects		In humans ingestion of barium compounds may cause gastroenteritis (vomiting, diarrhoea, abdominal pain), hypotassaemia, hypertension, cardiac arrhythmias, and skeletal muscle paralysis. The toxicity is dependent on the water solubility of the barium compound; the lack of case reports of systemic toxicity despite the routine oral administration for many years of approximately 450 g barium sulfate as a radio contrast medium indicates that this practically insoluble barium compound is not toxic by the oral route. Due to its limited absorption by the dermal route, systemic toxicity is not anticipated. Aspiration of small amounts of barium sulfate into the lungs has not been associated with adverse effects, and hence it has been used as a bronchiographic contrast agent. Most inhaled barium sulfate is cleared from the lungs with no evidence that residual barium sulfate causes fibrotic pulmonary changes or toxicity. Several case reports and a cross-sectional examination of workers at a barite grinding facility indicated reversible baritosis in workers exposed to airborne barite ore or barium sulfate.	W, A
		No reproductive/developmental effects have been identified in animal studies. No carcinogenic effects have been identified in the available studies. In addition the data (based on weight of evidence) indicated that barium salts would not be expected to have a genotoxic potential.	W
Classifications		Barium compounds have not been classified by IARC. The USEPA has considered barium as not likely to be carcinogenic to humans following oral exposure and its carcinogenic potential cannot be determined following inhalation exposure.	
Guidelines	Soil	15000 mg/kg (residential soil guideline based on soluble barium compounds) 190000 mg/kg (industrial soil guideline based on soluble compounds)	U
	Drinking water	2 mg/L, based on studies undertaken on soluble barium compounds. No guideline available for barium sulfate	N

Compound		Barite sulfate (barium sulfate)	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be low as barium sulfate is a less bioavailable form of barium and the available data does not indicate that it is toxic via oral, dermal or inhalation pathways	2
Ecological			
General		Barium sulfate is the principal constituent of drilling muds used in oil drilling operations. These muds also contain metals other than barium. No deaths occurred in a number of unspecified marine fish, crustaceans, and molluscs exposed to various levels (as high as 7500 mg/kg) of drilling mud for an unspecified period of time. Other studies reported reduced populations of molluscs and/or annelids exposed to barite in estuarine water, but it could not be determined whether the results were due to larval avoidance of barite or to barite toxicity	W
Aquatic toxicity data (mg/L)	NOEL	68 mg/L for water flees (48-hr) for soluble barium	W
	EC50	52.8 mg/L (24 hour) and 32 mg/L (48 hour) for barium sulfate, daphids	W
	General		C
Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		In general barium sulfate is not soluble in water and if it is present in an aquatic environment it readily precipitates out. This form of barium is less bioavailable to aquatic species and at a available from the use of barium sulfate in drilling muds has indicated it has a low toxicity to aquatic species.	2

A = Alberta Canada 2009, Soil Remediation Guidelines for Barite: Environmental Health and Human Health

W = CICAD 13, Barium and Barium Compounds, WHO 2001

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

H = data available from HSDB (accessed in February 2013)

S = occupational guidelines available from Safework Australia (retrieved February 2013)

N = available from NHMRC (2011) Australian Drinking Water Guidelines

U = USEPA Regional Screening Levels

Compound		Sodium Carbonate	
Proposed concentration in fracturing fluid (mg/L)		450 (approx.)	AGL
Listed on AICS		yes	
NICNAS		Not assessed, but listed on the High Volume Industrial Chemicals List and classified under NOHSC	
CAS No.		497-19-8	M
Molecular Formula		C-Na-O3	
Colour/ Form		white powder/crystals	M
Odour/ Taste		odourless	M
Odour Threshold		NA	
Corrosive		yes	
Explosive		No	
Irritation		eye irritant, mild skin irritant, may cause respiratory irritation	M
Stability		stable	M
Incompatibility		acids, acid salts	H
Solubility (mg/L in water (20-25oC))		3.07E+05	H
Molecular weight		105.99	H
pH		11.3 (1% solution)	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	
Potential for bioaccumulation (BCF)		low	OEC D
Degradation potential	Soil	Readily dissociates to sodium and carbonate ions	OEC D
	Water		
Comments		Dissociates rapidly to sodium and carbonate ions that do not sorb to particulates or accumulate in living tissues. Carbonate ions will react with water to form bicarbonate and hydroxide. Both sodium and bicarbonate ions have a wide natural occurrence.	OEC D
Ranking - Fate and Transport		Overall, the potential for migration to a receiving environment is considered to be negligible to low.	2
Human Health			
General		Compound is alkaline where most of the adverse effects reported are due to irritation effects. The compound is used in cosmetics, soap, detergents and in a range of food products.	OEC D
Acute Effects		The low toxicity of sodium carbonate is confirmed by the human experience. These compounds have a high pH and are irritating to the skin, eyes, respiratory tract and mucous membranes. Although sodium carbonate has been used widely and for a long time, no cases of acute oral poisoning have been found in the published literature. The low oral toxicity of sodium carbonate can be explained by the neutralisation of sodium carbonate in the stomach. Sodium carbonate has an acute oral LD50 of 2800 mg/kg.	OEC D
Occupational Inhalation Guidelines (mg/m3)	TWA	NA	
	Peak	NA	
Ranking - Occupational		On the basis of the chemical properties and acute toxicity of the	2

Compound		Sodium Carbonate	
Risk Issues		compound - occupational hazard ranking determined as low where appropriate PPE is required for the use of this chemical	
Chronic Effects		Limited data is available in relation to the repeated or long-term toxicity of this compound, however the OECD review identified potential effects on the lungs and long-term effects of sodium intakes are of potential importance. Carbonate is neutralised in the stomach by the low pH and sodium carbon is not expected to be systemically absorbed into the body due to neutralisation in the stomach and blood.	OECD
		The available studies have not shown that these compounds have carcinogenic or genotoxic potential.	OECD
Guidelines	Soil	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		Chronic effects considered to be negligible, however some mild transient effects may be associated with elevated pH	1-2
Ecological			
General		The hazard of sodium carbonate for the environment is caused by the pH effect of the carbonate ion. For this reason the effect of this compound on the organisms depends on the buffer capacity of the terrestrial or 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 aquatic toxicity tests were > 100 mg/L. It is not considered useful to calculate a guideline for these compounds 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 these compounds could locally increase the pH in the local aquatic environment.	OECD
Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		If released directly to a receiving environment there is the potential for adverse ecological effects, primarily associated with the potential for short term increased pH. Long term hazards (once pH is neutralised) are considered to be low.	2-3

OECD 2002. OECD SIDS Initial Assessment Report for Sodium Carbonate, October 2002.

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

H = data available from HSDB (accessed in February 2013)

S = occupational guidelines available from Safework Australia (retrieved February 2013)

Compound		Cellulose fibres	
Proposed concentration (mg/L)	Actual concentration not known as use will only be as required		AGL
MSDS Available	yes		
Listed on AICS	cellulose and range of cellulose compounds assessed		
NICNAS	Not assessed		
CAS No.	NA		
Molecular Formula	NA		
Colour/ Form	light brown odorless fibrous powder		M
Odour/ Taste	NA		M
Odour Threshold	NA		M
Corrosive	no		M
Explosive	dust may form explosive mixture with air and source of ignition		M
Irritation	dust may be irritating to eye, skin and respiratory tract		M
Stability	stable		M
Incompatibility	oxidising agents		M
Solubility (mg/L in water (20-25oC))	Insoluble in water, floats on water		M
Molecular weight	NA		
pH	6.5-7.5		M
Vapour Pressure (mmHg at 20-25oC)	NA		
Vapour Density (air = 1)	NA		
Henry's Law (atm.m ³ /mol at 20-25oC)	NA		
Volatility potential	Soil	no	
	Water	no	
Log Kow	NA		
Koc	NA		
Soil Adsorption/ Mobility	Will not be mobile in the environment as the fibres are insoluble		E
Potential for bioaccumulation (BCF)	No		E
Degradation potential	Soil	Cellulose fibres occur naturally in the environment and are readily degraded by bacteria and fungi.	W
	Water		
Ranking - Fate and Transport	This compound is not mobile in the environment, not soluble in water and readily breaks down, hence the potential for off-site migration is considered negligible		1
Human Health			
	General	Limited data is available, however the available data indicated that inhaled cellulose fibres have a slow clearance in the respiratory system. Once inhaled the fibres are associated with mild transient pulmonary inflammation, however the inflammation is not sustained. The fibres do not react with components of the lung and are not shortened by enzymatic digestion. The available studies have not shown evidence of carcinogenic effects.	E
	Acute Effects	Acute effects are associated with irritation from the small fibres, which can be effectively managed with the use of appropriate PPE	M
Occupational Inhalation Guidelines (mg/m ³)	TWA	10 - based on cellulose as paper fibre	S
	STEL	NA	S

Compound		Cellulose fibres	
Ranking - Occupational Risk Issues		On the basis of the chemical properties and acute toxicity of the compound - occupational hazard ranking determined as low as exposures can be effectively managed.	2
Chronic Effects		Review of ingestion of microcrystalline cellulose commonly present in food products did not identify any toxic effects in humans. Small particles may be persorbed (which is higher with smaller particles) however there is no evidence that this absorption is associated with adverse effects. The available studies have not shown evidence of carcinogenic effects.	W,E
Classifications		Not classified	
Guidelines	Soil	NA	
	Drinking water	NA	
Ranking - Chronic Health Impacts		The potential for adverse effects on health is considered to be negligible	1
Ecological			
General		No ecotoxicity studies or evaluations are available for cellulose fibres, however as these fibres are insoluble and float on the water surface if sufficient mas is spilled directly into a water body they may cause harm via the generation of an anoxic environment.	
Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		Unless spilled directly into a water body (significant mass spilled) the potential for toxic effects is considered negligible.	1

E = European Commission, Opinion on Risk to human health from chrysotile asbestos and other organic substitutes, December 2002.

W = WHO Food Additive Series 40, 1998

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

H = data available from HSDB (accessed in February 2013)

S = occupational guidelines available from Safework Australia (retrieved February 2013)

Compound		Starch	
Proposed concentration in hydraulic fracturing fluid (mg/L)	5 (approx..)		AGL
MSDS Available	yes		
Listed on AICS	yes		
NICNAS	Not assessed		
CAS No.	9005-25-8		M
Molecular Formula	(2R,3S,4S,5R,6R)-2-(hydroxymethyl)-6-[(2R,3S,4R,5R,6S)-4,5,6-trihydroxy-2-(hydroxymethyl)oxan-3-yl]oxy-oxane-3,4,5-triol [(C6-H10-O5) _n (polymer of glucose)]		M
Colour/ Form	white powder		M
Odour/ Taste	slight characteristic odour		M
Odour Threshold	NA		M
Corrosive	non corrosive		M
Explosive	Dust-air mixtures may ignite or explode		M
Irritation			M
Stability	decomposes on heating		M
Incompatibility	reactive with oxidising agents		M
Solubility	not soluble in water		
Solubility (mg/L in water (20-25oC))	NA		
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	very low	
	Water	very low	
Log Kow	NA		
Koc	NA		
Soil Adsorption/ Mobility	NA		
Potential for bioaccumulation (BCF)	NA		
Degradation potential	Soil	NA	
	Water	NA	
Ranking - Fate and Transport	Starch is already widely dispersed in the environment as it is naturally occurring in some plants. Once released to the environment in powder form it will be degraded by bacteria.		1-2
Human Health			
Acute Effects	Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Non-hazardous in case of ingestion.		M
Occupational Inhalation Guidelines (mg/m3)	TWA	10 mg/m3	S
	STEL		
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

Compound		Starch	
Chronic Effects		Repeated or prolonged exposure is not known to aggravate any medical condition. Starch is consumed as part of human diets (by eating some plants like potatoes) so no NOAELs or other guidelines developed.	M
Classifications		IARC has not assessed starch	I
Guidelines	Soil	NA	
	Drinking water	NA	
	NOAEL	NA	
	NOAEL	NA	
	DWGp	NA	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be negligible.	1
Ecological			
General		Limited data is available in relation to ecotoxicological data	M, U2
Aquatic toxicity data (mg/L)	NOEC aquatic invertebrates	1-3 g/L oysters	U2
	NOEC - fish	5 g/L	U2
	General	Not very toxic based on this information. Given the lack of solubility it is likely that it is a smothering effect that occurs at these high concentrations rather than a toxic effect.	U2
Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		Not very toxic. Indicative water quality guidelines based on this data would be >10 mg/L.	1

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

S = occupational guidelines available from Safework Australia (retrieved February 2013)

I = IARC classification <http://monographs.iarc.fr/ENG/Classification/index.php>

U2 = USEPA Ecotox Database Search (February 2013) <http://cfpub.epa.gov/ecotox/>

Compound		Benzalkonium chloride (Active ingredient in Murine Eyedrops)	
Proposed concentration in hydraulic fracturing fluid (mg/L)	75 (approx.)		AGL
MSDS Available	yes		
Listed on AICS	yes		
NICNAS	Assessed as to skin sensitisation potential - found not to be a skin sensitiser		
CAS No.	8001-54-5		M
Colour/ Form	white to yellowish powder/lumpy solid		M
Odour/ Taste	aromatic odour/bitter taste		M
Odour Threshold	NA		
Corrosive	Considered corrosive		M
Explosive	Fine dust dispersed in air in sufficient concentrations and in the presence of an ignition source is a potential dust explosion hazard		M
Irritation	Irritating to eyes, skin and respiratory tract. May cause skin sensitisation (allergic reaction)		M
Stability	Stable. Hygroscopic (absorbs water). Incompatible with nitrates and anion detergents.		M
Incompatibility	Reactive with oxidising agents. Excess heat. Excess moisture.		M
Solubility	Soluble in cold and hot water, acetone, alcohol, benzene. Slightly soluble in diethylether.		M
Solubility (mg/L in water (20-25oC))	Soluble (NA)		
Molecular weight			H
pH	cationic form pH 5-9 (7.59)		H
Vapour Pressure (mmHg at 20-25oC)	Very low		H
Vapour Density (air = 1)	NA		
Henry's Law (atm.m3/mol at 20-25oC)	NA		
Volatility potential	Soil	very low	
	Water	very low	
Log Kow	3.9 (difficult to determine for surfactants)		U
Koc	640000 - 6100000		H
Soil Adsorption/ Mobility	Strongly absorbed to suspended particles and sediments, immobile in soil and sediments		H
Potential for bioaccumulation (BCF)	No		H
Degradation potential	Soil	These chemicals are difficult to assess because they are surfactants. They are highly sorbed to suspended sediments and benthic sediments. Environment Canada and USEPA state that they are readily degraded by microorganisms in soil and sediments but the normal tests may not pick this up well.	H, U, C
	Water		H, U, C
Ranking - Fate and Transport	If released into the environment it will absorb to particles, not be very mobile, remain in cationic form and be broken down over time by bacteria in the sediments.		2

Compound		Benzalkonium chloride (Active ingredient in Murine Eyedrops)	
Human Health			
General		Health effects from exposure to this compound are principally associated with acute exposures in occupational environments.	
Acute Effects		Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive) and eye contact (corrosive). The amount of tissue damage depends on the length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterised by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterised by redness, watering and itching. Skin inflammation is characterised by itching, scaling, reddening or occasionally blistering.	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		May be toxic to kidneys, liver, heart, gastrointestinal tract, cardiovascular system and central nervous system. Possible reproductive system toxin. Repeated or prolonged exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.	M
Classifications		Not assessed by IARC. USEPA classified as not carcinogenic, not mutagenic, not genotoxic	I, U
Guidelines	Soil	NA	
	Drinking water	NA	
	NOEL - dietary	44 mg/kg/d for chronic/carcinogenicity study in rats (UF = 100) Chronic RfD = 0.44 mg/kg/d	U
	NOEL - incidental oral	10 mg/kg/d rat developmental tox study	U
	NOEL - short-term dermal	20 mg/kg/d based on 21 day toxicity study for 4% a.i. formulated product	U
	NOEL - inhalation	3 mg/kg/d oral developmental study in rabbits (laboured breathing) - assumed inhalation absorption is equal to oral absorption	U
	DWGp	Based on the lowest NOEL and the equation presented in the report, adopting an UF of 100 (as recommended in the USEPA RED) = 0.1 mg/L	
Ranking - Chronic Health Impacts		The potential for long term human health impacts, should exposure occur, is considered to be high due to the potential for concentrations in hydraulic fracturing fluids to be higher than the DWGp	4

Compound		Benzalkonium chloride (Active ingredient in Murine Eyedrops)	
Ecological			
General		Limited data is available in relation to ecotoxicological data	
Aquatic toxicity data (mg/L)	NOEC - aquatic invertebrates	0.006 mg/L acute; 0.004 mg/L chronic (USEPA ECOTOX - shrimps and prawns LC50 0.9-3 mg/L/ LC100 4 to 10 mg/L - EC50 Daphnia - behaviour - 0.03 to 2mg/L similar for LC50s)	U
	NOEC - fish	0.28 mg/L LC50; 0.032 mg/L chronic effects (USEPA ECOTOX - EC50 medaka 0.75 LC50s 0.3 to 7mg/L - similar values for behaviour and mortality endpoints)	U
	NOEC - algae	USEPA ECOTOX various green algae 0.05 to 0.5 mg/L	U2
	General	Given that benzalkonium chloride is an algacide, bactericide, fungicide, microbiocide, molluscicide and slimicide, it is expected to adversely affect microorganisms	H
Guidelines	Fresh water	NA	
	Marine water	NA	
Ranking - Ecological Impacts		An indicative water quality guideline for this chemical would be of the order of 0.0004 mg/L making it a very hazardous chemical. Given its purpose is to control the growth of microorganisms this makes sense.	4

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

H = data available from HSDB (accessed in February 2013)

C = CCME Canadian Water Quality Guideline for DDAC <http://ceqg-rcqe.ccme.ca/?config=ccme&thesite=ceqg&words=&image.x=0&image.y=0>

U = USEPA Reregistration Eligibility Decision for Alkyl Dimethyl Benzyl Ammonium Chloride (ADBAC) http://www.epa.gov/oppsrrd1/REDs/adbac_red.pdf

U2 = USEPA Ecotox Database Search (February 2013) <http://cfpub.epa.gov/ecotox/>

I = IARC classification <http://monographs.iarc.fr/ENG/Classification/index.php>

Compound		Calcium Chloride	
Proposed concentration	2-3%		AGL
Listed on AICS	yes		
NICNAS	Not assessed		
CAS No.	10043-52-4		M
Molecular Formula	CaCl ₂		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.m ³ /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, if 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
Compound			
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		Amine polymer derivative	
Proposed concentration	Actual concentration not known as use will only be as required		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°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,
	Water		US
Ranking - Fate and Transport	Compound is expected to sorb to soil/sediment and not be mobile.		2
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

Compound		Amine polymer derivative	
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 in Drilling



an **imdex** limited company

AMC Aus-Dex

Chemwatch Material Safety Data Sheet

Issue Date: 9-Feb-2010

XC9317TC

Hazard Alert Code: MODERATE

CHEMWATCH 8706-23

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

AMC Aus-Dex

PRODUCT USE

Drilling fluid additive, filtrate reducer.

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**

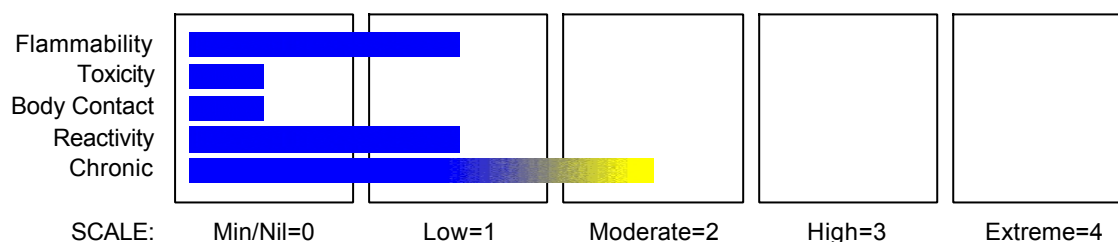
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

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

CHEMWATCH HAZARD RATINGS



RISK

•None under normal operating conditions.

SAFETY

•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
starch	9005-25-8	100

continued...

Section 4 - FIRST AID MEASURES

SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

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 contact occurs:
 - Immediately remove all contaminated clothing, including footwear.
 - Flush skin and hair with running water (and soap if available).
 - Seek medical attention in event of irritation.

INHALED

- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

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

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use water delivered as a fine spray to control fire and cool adjacent area.

FIRE/EXPLOSION HAZARD

- Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds.; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- In the same way as gases and vapours, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL).are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC)
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

May emit clouds of acrid smoke.

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Section 5 - FIRE FIGHTING MEASURES

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM

None

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Respirator:

Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.

MAJOR SPILLS

- Moderate hazard.
- CAUTION: Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
 - Check all containers are clearly labelled and free from leaks.
- 25 kg multi-walled paper bags or 15 kg plastic pails.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidising agents, acids.

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 ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

continued...

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
Australia Exposure Standards	starch (Starch (a))		10						(see Chapter 14)

PERSONAL PROTECTION



RESPIRATOR

•Particulate. (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

■ Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocarbon

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

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.

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

Off-white odourless powder; soluble in water at ambient temperatures.

PHYSICAL PROPERTIES

Mixes with water.

State	Divided Solid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Miscible
Flash Point (°C)	>125	pH (1% solution)	Not Available
Decomposition Temp (°C)	Not Available	pH (as supplied)	4.0- 6.0
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Applicable
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	1.52
Lower Explosive Limit (%)	Not Available	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Applicable	Evaporation Rate	Not Applicable

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 AUS-DEX:

- Not available. Refer to individual constituents.

STARCH:

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

TOXICITY

Intraperitoneal (Mouse) LD50: 6600 mg/kg

- 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.

IRRITATION

Skin (human): 0.3 mg/3d- I Mild

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 Aus-Dex

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Section 12 - ECOLOGICAL INFORMATION

AMC Aus- Dex	No Data Available	No Data Available	
starch	No Data Available	No Data Available	LOW

Section 13 - DISPOSAL CONSIDERATIONS

- 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

starch (CAS: 9005-25-8) is found on the following regulatory lists;

"Australia Exposure Standards", "Australia Inventory of Chemical Substances (AICS)", "International Fragrance Association (IFRA) Survey: Transparency List"

No data for AMC Aus-Dex (CW: 8706-23)

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.

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AMC Aus-Dex

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Section 16 - OTHER INFORMATION

This is the end of the MSDS.

AMC Barite

Hazard Alert Code: MODERATE

Chemwatch Material Safety Data Sheet
Issue Date: 29-Aug-2012
A317LP

CHEMWATCH 6099-31
Version No:3.1.1.1
Page 1 of 13

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

AMC Barite

PRODUCT USE

Drilling fluids compound weighting material.

SUPPLIER

Company: AMC

Address:

5 Pitino Court

Osborne Park

WA, 6017

Australia

Telephone: +61 8 9445 4000

Emergency Tel: **1800 039 008** or **+61 3 9573 3112**

Emergency Tel: **+800 2436 2255 +613 9573 3112**

Fax: +61 8 9445 4040

Company: AMC

Address:

PO Box 1141

Osborne Park

WA, 6916

Australia

Telephone: +61 8 9445 4000

Emergency Tel: **1800 039 008**

Emergency Tel: **+800 24 36 22 55**

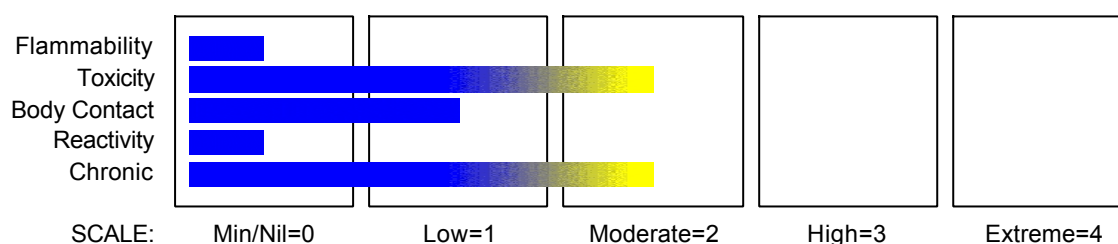
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

CHEMWATCH HAZARD RATINGS



RISK

- Harmful: danger of serious damage to health by prolonged exposure through inhalation.
- Inhalation may produce health damage*.

SAFETY

- Do not breathe dust.
- Avoid contact with skin.

continued...

AMC Barite

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Section 2 - HAZARDS IDENTIFICATION

■ Cumulative effects may result following exposure*.

■ May produce discomfort of the respiratory system*.

* (limited evidence).

• Wear suitable protective clothing.

• Wear suitable gloves.

• Use only in well ventilated areas.

• Keep container in a well ventilated place.

• To clean the floor and all objects contaminated by this material, use water and detergent.

• Keep away from food, drink and animal feeding stuffs.

• If swallowed, IMMEDIATELY contact Doctor or Poisons Information Centre. (show this container or label).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
barium sulfate	7727-43-7	95
silica crystalline - quartz	14808-60-7	5

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.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

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 dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear breathing passages.
- Ask patient to rinse mouth with water but to not drink water.

continued...

AMC Barite

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Section 4 - FIRST AID MEASURES

- Seek immediate medical attention.

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 in the event of a fire.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Non combustible.
 - Not considered a significant fire risk, however containers may burn.
- Decomposition may produce toxic fumes of: sulfur oxides (SO_x).

FIRE INCOMPATIBILITY

- None known.

HAZCHEM

None

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

Moderate hazard.

- CAUTION: Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.
- Recover product wherever possible.
- IF DRY: Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic

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Section 6 - ACCIDENTAL RELEASE MEASURES

bags or other containers for disposal. IF WET: Vacuum/shovel up and place in labelled containers for disposal.

- ALWAYS: Wash area down with large amounts of water and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise Emergency Services.

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

Section 7 - HANDLING AND STORAGE**PROCEDURE FOR HANDLING**

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

- Glass container is suitable for laboratory quantities.
- Polyethylene or polypropylene container.
- 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.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+: May be stored together

O: May be stored together with specific preventions

AMC Barite

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Section 7 - HANDLING AND STORAGE

X: *Must not be stored together*

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
Australia Exposure Standards	barium sulfate (Barium sulphate (a))		10						(see Chapter 14)
Australia Exposure Standards	silica crystalline - quartz (Silica - Crystalline Quartz)		0.1						(see Chapter 14)

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
silica crystalline - quartz 21686	50	

MATERIAL DATA

AMC BARITE:

Not available

BARIUM SULFATE:

Barium sulfate has been identified as a nontoxic dust. However high dust levels have caused benign pneumoconiosis (baritosis). The TLV-TWA is thought to be protective against the risk of eye, nose and upper respiratory tract irritation and perhaps, pneumoconiosis.

for barium compounds:

The recommended TLV-TWA is based on satisfactory results achieved while employing an internal limit for barium nitrate at a national laboratory. It is not known what degree of added safety this limit incorporates.

SILICA CRYSTALLINE - QUARTZ:

The concentration of dust, for application of respirable dust limits, is to be determined from the fraction that penetrates a separator whose size collection efficiency is described by a cumulative log-normal function with a median aerodynamic diameter of 4.0 µm (+-) 0.3 µm and with a geometric standard deviation of 1.5 µm (+-) 0.1 µm, i.e. generally less than 5 µm.

Because the margin of safety of the quartz TLV is not known with certainty and given the associated link between silicosis and lung cancer it is recommended that quartz concentrations be maintained as far below the TLV as prudent practices will allow.

WARNING: For inhalation exposure ONLY:

This substance has been classified by the ACGIH as A2 Suspected Human Carcinogen.

PERSONAL PROTECTION

continued...



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

- The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and

has to be observed when making a final choice.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

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

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.

Application of a non-perfumed moisturiser is recommended.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

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

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

■ Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.

An approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

White/grey/tan odourless powder; insoluble in water.

PHYSICAL PROPERTIES

Does not mix with water.

Sinks in water.

State	Divided Solid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Immiscible
Flash Point (°C)	Not Applicable	pH (1% solution)	Not Applicable
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not Applicable
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Applicable
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	4.2- 4.25

continued...

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Applicable	Evaporation Rate	Not Applicable

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

SWALLOWED

■ The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (eg. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

Sulfates are not well absorbed orally, but can cause diarrhoea.

EYE

■ Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterised by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.

SKIN

■ The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ Inhalation of dusts, generated by the material during the course of normal handling, may be damaging to the health of the individual.

Effects on lungs are significantly enhanced in the presence of respirable particles.

CHRONIC HEALTH EFFECTS

■ Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.

Harmful: danger of serious damage to health by prolonged exposure through inhalation.

continued...

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Section 11 - TOXICOLOGICAL INFORMATION

Barium compounds may cause high blood pressure, airway irritation and damage the liver, spleen and bone marrow. Prolonged exposure may cause a lung inflammation and scarring. Symptoms of this include a worsening dry cough, shortness of breath on exertion, increased chest expansion and weakness. Stringy phlegm in the cough appears later, with more difficulty in breathing and a further loss of lung capacity. Barium sulfate does not cause permanent scarring of the lungs.

TOXICITY AND IRRITATION

AMC BARITE:

- Not available. Refer to individual constituents.

BARIUM SULFATE:

- No significant acute toxicological data identified in literature search.

SILICA CRYSTALLINE - QUARTZ:

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

TOXICITY

Inhalation (human) LCLo:0.3 mg/m³/10Y

Inhalation (human) TCLo:16 mppcf*/8H/17.9Y

Inhalation (rat) TCLo:50 mg/m³/6H/71W

- **WARNING:** For inhalation exposure ONLY: This substance has been classified by the IARC as Group 1:

CARCINOGENIC TO HUMANS.

The International Agency for Research on Cancer (IARC) has classified occupational exposures to respirable (<5 µm) crystalline silica as being carcinogenic to humans. This classification is based on what IARC considered sufficient evidence from epidemiological studies of humans for the carcinogenicity of inhaled silica in the forms of quartz and cristobalite. Crystalline silica is also known to cause silicosis, a non-cancerous lung disease.

Intermittent exposure produces; focal fibrosis, (pneumoconiosis), cough, dyspnoea, liver tumours.

* Millions of particles per cubic foot (based on impinger samples counted by light field techniques).

NOTE : the physical nature of quartz in the product determines whether it is likely to present a chronic health problem. To be a hazard the material must enter the breathing zone as respirable particles.

IRRITATION

Nil Reported

CARCINOGEN

silica crystalline
- quartz

International
Agency for
Research on Cancer
(IARC) - Agents
Reviewed by the
IARC Monographs

Group

1

Carcinogenic to
humans

Section 12 - ECOLOGICAL INFORMATION

SILICA CRYSTALLINE - QUARTZ:

BARIUM SULFATE:

DO NOT discharge into sewer or waterways.

BARIUM SULFATE:

For Inorganic Sulfate:

Environmental Fate - Sulfates can produce a laxative effect at concentrations of 1000 - 1200 mg/liter, but no increase in diarrhea, dehydration or weight loss. The presence of sulfate in drinking-water can also result

continued...

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Section 12 - ECOLOGICAL INFORMATION

in a noticeable taste. Sulfate may also contribute to the corrosion of distribution systems. No health-based guideline value for sulfate in drinking water is proposed.

Atmospheric Fate: Sulfates are removed from the air by both dry and wet deposition processes. Wet deposition processes including rain-out (a process that occurs within the clouds) and washout (removal by precipitation below the clouds) which contribute to the removal of sulfate from the atmosphere.

Terrestrial Fate: Soil - In soil, the inorganic sulfates can adsorb to soil particles or leach into surface water and groundwater. Plants - Sodium sulfate is not very toxic to terrestrial plants however; sulfates can be taken up by plants and be incorporated into the parenchyma of the plant. Some plants (e.g. corn and Kochia Scoparia) are capable of accumulating sulfate to concentrations that are potentially toxic to ruminants. Jack pine are the most sensitive plant species.

Aquatic Fate: Sulfate in water can also be reduced by sulfate bacteria (Thiobacilli) which use them as a source of energy. In anaerobic environments sulfate is biologically reduced to (hydrogen) sulfide by sulfate reducing bacteria, or incorporated into living organisms as source of sulfur. Sodium sulfate is not reactive in aqueous solution at room temperature. Sodium sulfate will completely dissolve, ionize and distribute across the entire planetary "aquasphere". Some sulfates may eventually be deposited with the majority of sulfates participating in the sulfur cycle in which natural and industrial sodium sulfates are not distinguishable.

Ecotoxicity: Significant bioconcentration or bioaccumulation is not expected. Algae are the most sensitive to sodium sulfate and toxicity occurs in bacteria from 2500mg/L. Sulfates are not acutely toxic to fish or invertebrates. Daphnia magna water fleas and fathead minnow appear to be the least sensitive species.

Activated sludge showed a very low sensitivity to sodium sulfate. Overall it can be concluded that sodium sulfate has no acute adverse effect on aquatic and sediment dwelling organisms. No data were found for long term toxicity.

For Barium and its Compounds:

Environmental Fate: Barium is a highly reactive metal occurring naturally only in a combined state, primarily as inorganic complexes. Conditions such as pH, oxidation-reduction potential, cation exchange capacity, and the presence of sulfate, carbonate, and the presence of metal oxides will affect the partitioning of barium and its compounds in the environment. The element is released to environment by both natural processes and man-made sources. Most barium released to the environment from industrial sources is in forms that do not become widely dispersed.

Atmospheric Fate: In the atmosphere, barium is likely to be present in particulate form. Barium compounds will be removed from the atmosphere via wet/dry deposition. The substance may change to different forms of barium in the air.

Terrestrial Fate: Soil - Barium will leach from geological formations to groundwater and will adsorb to soil.

Barium is not very mobile in most soil systems and will form soluble complexes with fulvic/humic acids.

Transportation rates of barium in soil are dependent on the characteristics of soil material. In soils with high positive ion exchange capacity, (e.g., fine textured mineral soils or soils with high organic matter content), barium mobility will be limited by adsorption. Soils high in calcium carbonate leave barium carbonate residues, which limit mobility. Barium produces barium sulfate residues in the presence of sulfates. Barium is more mobile, and is more likely to be leached, from soils in the presence of chloride and under acidic conditions. Barium binds with fatty acids, (e.g., in acidic landfill leachate), and will be much more mobile in soils containing fatty acids. Plants - Barium is not expected to concentrate in plants, relative to amounts found in soils; however, there are some plants, (beans, forage plants, Brazil nuts, and mushrooms), which accumulate barium.

Aquatic Fate: Barium will adsorb to sediment/suspended particulate matter. Precipitation of barium sulfate salts is accelerated where rivers enter the ocean. Sedimentation of suspended solids removes a large portion of the barium content from surface waters. Barium in sediments is found largely in the form of barium sulfate, (barite).

Ecotoxicity: Barium concentration will increase as it moves up the food chain in both land and aquatic species. In aquatic media, barium is likely to precipitate out of solution as an insoluble salt, (i.e. barium sulfate/barium sulfite). The uptake of barium by fish and marine organisms is also an important removal mechanism. Barium may concentrate in marine plants by a factor of 400-4,000 times the level present in the water. The substance may concentrate in marine animals, plankton, and brown algae.

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Section 12 - ECOLOGICAL INFORMATION

SILICA CRYSTALLINE - QUARTZ:

For Silica:

Environmental Fate: Most documentation on the fate of silica in the environment concerns dissolved silica, in the aquatic environment, regardless of origin, (man-made or natural), or structure, (crystalline or amorphous).

Terrestrial Fate: Silicon makes up 25.7% of the Earth's crust, by weight, and is the second most abundant element, being exceeded only by oxygen. Silicon is not found free in nature, but occurs chiefly as the oxide and as silicates. Once released into the environment, no distinction can be made between the initial forms of silica.

Aquatic Fate: At normal environmental pH, dissolved silica exists exclusively as monosilicic acid. At pH 9.4, amorphous silica is highly soluble in water. Crystalline silica, in the form of quartz, has low solubility in water. Silicic acid plays an important role in the biological/geological/chemical cycle of silicon, especially in the ocean. Marine organisms such as diatoms, silicoflagellates and radiolarians use silicic acid in their skeletal structures and their skeletal remains leave silica in sea sediment

Ecotoxicity: Silicon is important to plant and animal life and is practically non-toxic to fish including zebrafish, and Daphnia magna water fleas.

For Metal:

Atmospheric Fate - Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air.

Environmental Fate: Environmental processes, such as oxidation, the presence of acids or bases and microbiological processes, may transform insoluble metals to more soluble ionic forms. Environmental processes may enhance bioavailability and may also be important in changing solubilities.

Aquatic/Terrestrial Fate: When released to dry soil, most metals will exhibit limited mobility and remain in the upper layer; some will leach locally into ground water and/ or surface water ecosystems when soaked by rain or melt ice. A metal ion is considered infinitely persistent because it cannot degrade further. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. A significant proportion of dissolved/ sorbed metals will end up in sediments through the settling of suspended particles. The remaining metal ions can then be taken up by aquatic organisms. Ionic species may bind to dissolved ligands or sorb to solid particles in water.

Ecotoxicity: Even though many metals show few toxic effects at physiological pH levels, transformation may introduce new or magnified effects.

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
barium sulfate	No Data	No Data	No Data	No Data
	Available	Available	Available	Available
silica crystalline - quartz	No Data	No Data	No Data	No Data
	Available	Available	Available	Available

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.

continued...

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Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:

None (ADG7)

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

Section 15 - REGULATORY INFORMATION

Indications of Danger:

Xn Harmful

POISONS SCHEDULE

None

REGULATIONS

Regulations for ingredients

barium sulfate (CAS: 7727-43-7, 13462-86-7) is found on the following regulatory lists;

"Acros Transport Information", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (Domestic water supply - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (STOCK - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm - Domestic water supply quality", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (STOCK)", "Australia Drinking Water Guideline Values For Physical and Chemical Characteristics", "Australia Exposure Standards", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "FisherTransport Information", "International Air Transport Association (IATA) Dangerous Goods Regulations", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD List of High Production Volume (HPV) Chemicals", "Sigma-AldrichTransport Information", "WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established"

silica crystalline - quartz (CAS: 14808-60-7, 122304-48-7, 122304-49-8, 12425-26-2, 1317-79-9, 70594-95-5, 87347-84-0) is found on the following regulatory lists;

"Australia - New South Wales Hazardous Substances Prohibited for Specific Uses", "Australia - New South Wales Hazardous Substances Requiring Health Surveillance", "Australia - Queensland Work Health and Safety Regulation - Hazardous chemicals (other than lead) requiring health monitoring", "Australia - Queensland Work Health and Safety Regulation - Restricted hazardous chemicals", "Australia - South Australia - Hazardous Substances Requiring Health Surveillance", "Australia - Tasmania Hazardous Substances Prohibited for Specified Uses", "Australia - Tasmania Hazardous Substances Requiring Health Surveillance", "Australia - Western Australia Hazardous Substances Prohibited for Specified Uses or Methods of Handling", "Australia - Western Australia Hazardous Substances Requiring Health Surveillance", "Australia Australian Safety and Compensation Council (ASCC) Draft National Code of Practice for the Control of Workplace Hazardous Chemicals - Schedule 4 Hazardous chemicals Requiring Health Surveillance", "Australia Exposure Standards", "Australia Hazardous Substances", "Australia Hazardous Substances Requiring Health Surveillance", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "Australia

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Section 15 - REGULATORY INFORMATION

Occupational Health and Safety (Commonwealth Employment) (National Standards) Regulations 1994 - Hazardous Substances Requiring Health Surveillance", "Australia Work Health and Safety Regulations 2011 - Hazardous chemicals (other than lead) requiring health monitoring", "Australia Work Health and Safety Regulations 2011 - Restricted hazardous chemicals", "FisherTransport Information", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD List of High Production Volume (HPV) Chemicals", "Sigma-AldrichTransport Information", "United Nations Consolidated List of Products Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments"

No data for AMC Barite (CW: 6099-31)

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
barium sulfate	7727-43-7, 13462-86-7
silica crystalline - quartz	14808-60-7, 122304-48-7, 122304-49-8, 12425-26-2, 1317-79-9, 70594-95-5, 87347-84-0

■ 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. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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This is the end of the MSDS.



MATERIAL SAFETY DATA SHEET

AMC BIOCIDES T



NOT HAZARDOUS*

Substance:	AMC Biocide T	Approved Criteria Classification:	Not allocated
Trade Names:	Biocide T	SUSDP Classification:	Not allocated
Product Use:	To treat SRB bacteria Change of Revision due to document review only.	ADG:	Not allocated
Creation Date:	14-May-2003	UN Number:	Not allocated
Revision Date:	21-Mar-2006		

* According to the criteria of NOHSC





Quick Summary*

General Properties:	Liquid, Colourless, Not available
Major Health Hazards:	May cause irritation to upper respiratory system, skin and eyes with contact.
PPE:	
Extinguishing Media:	Not available
Environment:	Avoid slips and falls. Wear protective equipment to prevent skin, eye and respiratory system contamination. Contain the spill. Prevent any accidental release from entering stormwater drains and reaching exposed surface areas. Sweep up dry spillages. The addition of water or rain will increase the difficulty to clean up any spill. Where the product becomes wet or is a gel, add sand, soil, or other absorbent. Shovel/scrape into containers for disposal. Dispose of contaminated material into a registered disposal location in accordance with relevant legislation.
Disposal:	DO NOT DISPOSE IN NORMAL WASTE BINS. Dispose of contaminated material into a registered disposal location in accordance with relevant legislation. Sweep up dry spillages. The addition of water or rain will increase the difficulty to clean up any spill. Where the product becomes wet or is a gel, add sand, soil, or other absorbent. Shovel absorbent into suitable, sealable, labelled drum for disposal.

Handling and Storage

Storage:	Containers must be clearly labelled and kept closed when not in use. Store in a well ventilated area away from strong oxidising agents.	
Exposure Limits:	ACGIH TLV-TWA for nuisance dust: = 10 mg/m ³ TWA Benzoalkonium chloride.	
Ventilation:	Use in a well ventilated area.	
Eye Protection:	 Or Face Shield	 RECOMMENDED

MATERIAL SAFETY DATA SHEET – AMC BIOCIDES T

Skin Protection:			 Rubber
Respiratory Protection:	 (AS1715,AS1716)		
Protective Material Types:	Long sleeve shirt and trousers.		

First Aid Measures

Scheduled Poisons:	Not allocated
Inhalation:	Remove to fresh air. Seek medical attention if symptoms persist.
Skin Contact:	Wash with soap and water. Seek medical attention if skin appears irritated.
Eye Contact:	Immediately irrigate with copious quantities of water for at least 15 minutes. Eyelids to be held open. Seek immediate medical assistance.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth with water. Give water to dilute. Seek medical attention and contact nearest Poisons Information Center.

Potential Health Effects

Inhalation:	May cause some irritation to the nose and upper respiratory system.
Skin Contact:	Wash with soap and water. Seek medical attention if skin appears irritated.
Eye Contact:	May cause some irritation to the eyes.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth with water. Give water to dilute. Seek medical attention and contact nearest Poisons Information Center.
Carcinogen (NOHSC, NTP, IARC):	Not classified
Major Health Hazards Summary:	May cause irritation to upper respiratory system, skin and eyes with contact.

Fire Fighting Measures

Fire and Explosion Hazards:	Not flammable or combustible
Extinguishing Media:	Not available
Fire Fighting Instructions:	Not available
Flash Point:	Not available

Accidental Release Measures

Occupational Release:	Avoid slips and falls. Wear protective equipment to prevent skin, eye and respiratory system contamination. Contain the spill. Prevent any accidental release from entering stormwater drains and reaching exposed surface areas. Sweep up dry spillages. The addition of water or rain will increase the difficulty to clean up any spill. Where the product becomes wet or is a gel, add sand, soil, or other absorbent. Shovel/scrape into containers for disposal. Dispose of contaminated material into a registered disposal location in accordance with relevant legislation.
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Environmental Information

Accidental Release:	Prevent any accidental release from entering stormwater drains and reaching exposed surface areas.
Environmental Risk Rating (EU Rating):	Not available
Environmental Toxicity:	Not available

Disposal Considerations:	DO NOT DISPOSE IN NORMAL WASTE BINS. Dispose of contaminated material into a registered disposal location in accordance with relevant legislation. Sweep up dry spillages. The addition of water or rain will increase the difficulty to clean up any spill. Where the product becomes wet or is a gel, add sand, soil, or other absorbent. Shovel absorbent into suitable, sealable, labelled drum for disposal.
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Toxicological Information

<i>Ingredients</i>	<i>CAS Number</i>	<i>Proportion</i>
tetrakis(hydroxymethyl)phosphonium Sulphate	555566-30-8	20-50%
Benzoalkonium chloride	259-709-0	<10%
Water	Not available	To 100%

Individual Ingredient Information

tetrakis(hydroxymethyl)phosphonium Sulphate

Irritation Data:	Not available
Toxicity Data:	Not available
Local Effects:	Not available
Acute Toxicity Level:	Not available
Target Organs:	Not available
Mutagenic Data:	Not available
Reproductive Effects Data:	Not available
Other:	Not available

Benzoalkonium chloride

Irritation Data:	Not available
Toxicity Data:	Not available
Local Effects:	Not available
Acute Toxicity Level:	Not available
Target Organs:	Not available
Mutagenic Data:	Not available
Reproductive Effects Data:	Not available
Other:	Not available

Water

Irritation Data:	Not available
Toxicity Data:	Not available
Local Effects:	Not available
Acute Toxicity Level:	Not available
Target Organs:	Not available
Mutagenic Data:	Not available
Reproductive Effects Data:	Not available
Other:	Not available

Physical and Chemical Properties

Physical State:	Liquid	Specific Gravity:	1.05@20°C
Colour:	Colourless	Water Solubility:	Soluble
Odour:	Not available	pH:	6-7
Boiling Point:	100 °C	Volatility:	Not available
Freezing Point:	21 °C	Odour Threshold:	Not available

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Vapour Pressure:	Not available	Evaporation Rate:	Not available
Vapour Density:	Not available	Coefficient of Water/Oil Distrib:	Not available

Stability and Reactivity

Reactivity:	Not available
Conditions to Avoid:	Not available
Incompatibilities:	Not available
Hazardous Decomposition:	Not available
Polymerization:	Not available

Transport Information

ADG Code:	Not allocated
Hazchem Code:	Not allocated
Special Provision:	Not allocated
Packaging Group:	0
Packaging Method:	Not allocated

Regulatory Information

Significant Legislation:	Not available
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Other Information

Contact Point:	Australian Mud Company Phone +61 8 9445 4000 mobile 0409 114 627
Other Information:	The information presented in this MSDS was obtained from recognised published data and is as accurate as possible. Since Australian Mud Company Pty Ltd cannot anticipate the conditions under which this information may be used, it is the user's responsibility to review the information in the context of the specific intended application and to comply with the federal, state and local government regulations controlling the disposal of the product.



an **imdex** limited company

AMC Fracseal-M (Medium)

Chemwatch Material Safety Data Sheet
Issue Date: 7-May-2009
XC9317TC

Hazard Alert Code: **LOW**

CHEMWATCH 02-1748
Version No:2.0
CD 2011/2 Page 1 of 6

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

AMC Fracseal-M (Medium)

PRODUCT USE

To combat lost circulation in highly fractured formations.

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

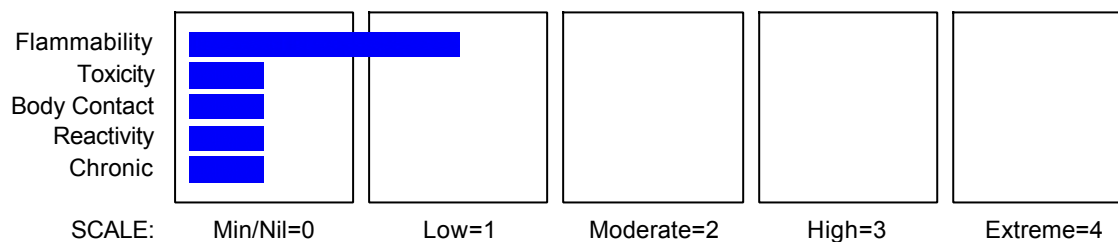
Company: AMC
Address:
PO Box 1141
Osborne Park
WA, 6916
Australia
Telephone: +61 8 9445 4000
Emergency Tel: **+61 400 966 951**
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

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

CHEMWATCH HAZARD RATINGS



RISK

•None under normal operating conditions.

SAFETY

•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
blend of long and short organic cellulose fiber		100

continued...

AMC Fracseal-M (Medium)

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet

Issue Date: 7-May-2009

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CHEMWATCH 02-1748

Version No:2.0

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Section 4 - FIRST AID MEASURES

SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

EYE

- If this product comes in contact with eyes:
 - Wash out immediately with water.
- If irritation continues, 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 dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

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

- Solid which exhibits difficult combustion or is difficult to ignite.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.
- Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited; once initiated larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.

FIRE INCOMPATIBILITY

- Avoid reaction with oxidising agents.

HAZCHEM

None

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

When handling larger quantities:

Respirator:

Particulate

continued...

AMC Fracseal-M (Medium)

Chemwatch Material Safety Data Sheet
Issue Date: 7-May-2009
XC9317TC

Hazard Alert Code: LOW

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Wear impervious gloves and safety glasses.
- Use dry clean up procedures and avoid generating dust.

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 and dust respirator.
- 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

- Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum.
- Packing as recommended by manufacturer.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidising agents.

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

PERSONAL PROTECTION



RESPIRATOR

- Particulate. (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,

continued...

AMC Fracseal-M (Medium)

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet

Issue Date: 7-May-2009

XC9317TC

CHEMWATCH 02-1748

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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

- 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.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc.

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

Light brown odourless fibrous powder; insoluble in water.

PHYSICAL PROPERTIES

Does not mix with water.

Floats on water.

State	Divided Solid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Immiscible
Flash Point (°C)	Not Available	pH (1% solution)	6.5- 7.5
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not Applicable
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Applicable
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	0.9
Lower Explosive Limit (%)	Not Available	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Applicable

Section 10 - STABILITY AND REACTIVITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Product is considered stable and hazardous polymerisation will not occur.

continued...

AMC Fracseal-M (Medium)

Chemwatch Material Safety Data Sheet
Issue Date: 7-May-2009
XC9317TC

Hazard Alert Code: LOW

CHEMWATCH 02-1748

Version No:2.0

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Section 10 - STABILITY AND REACTIVITY

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 FRACSEAL-M (MEDIUM):

- Not available. Refer to individual constituents.

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 Fracseal- M (Medium)	No Data Available	No Data Available		

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.

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

No data for AMC Fracseal-M (Medium) (CW: 02-1748)

continued...

AMC Fracseal-M (Medium)

Chemwatch Material Safety Data Sheet
Issue Date: 7-May-2009
XC9317TC

Hazard Alert Code: LOW

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Version No:2.0
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Section 16 - OTHER INFORMATION

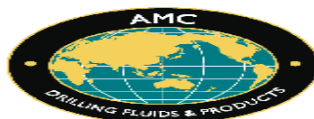
■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:
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.

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Issue Date: 7-May-2009
Print Date: 28-Jul-2011

This is the end of the MSDS.



an *index* limited company

AMC PENETROL XTRA

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

Hazard Alert Code: **LOW**

CHEMWATCH 7639-46
Version No:4.1.1.1
Page 1 of 6

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

AMC PENETROL XTRA

PRODUCT USE

Diamond drilling cutting fluid.

SUPPLIER

Company: AMC

Address:

PO Box 1141

Osborne Park

WA, 6916

Australia

Telephone: 61 8 9445 4000

Emergency Tel: **1800 039 008** or **+613 9573 3112**

Emergency Tel: **+800 24 36 22 55**

Fax: 61 8 9445 4040

Company: AMC

Address:

5 Pitino Court

Osborne Park

WA, 6017

Australia

Telephone: +61 8 9445 4000

Emergency Tel: **1800 039 008** or **+61 3 9573 3112**

Emergency Tel: **+800 24 36 22 55**

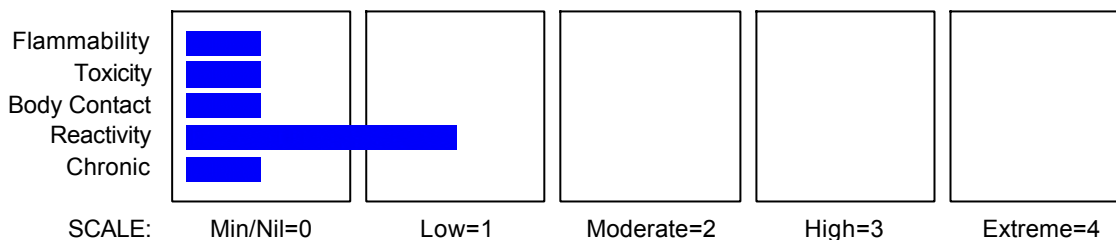
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

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

CHEMWATCH HAZARD RATINGS



RISK

•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
blend of refined vegetable oil		100
emulsifiers		
triglycerides		

continued...

AMC PENETROL XTRA

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

CHEMWATCH 7639-46
Version No:4.1.1.1
Page 2 of 6

Section 4 - FIRST AID MEASURES

SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

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

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

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.

FIRE/EXPLOSION HAZARD

- Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit irritating/ toxic fumes.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM

None

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.

continued...

AMC PENETROL XTRA

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

CHEMWATCH 7639-46

Version No:4.1.1.1

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Section 6 - ACCIDENTAL RELEASE MEASURES

Slippery when wet.

MAJOR SPILLS

- Moderate hazard.
 - Clear area of personnel and move upwind.
 - Alert Fire Brigade and tell them location and nature of hazard.
 - Wear breathing apparatus plus protective gloves.
 - Prevent, by any means available, spillage from entering drains or water course.
- Slippery when wet.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

SUITABLE CONTAINER

- Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

- Avoid contamination of water, foodstuffs, feed or seed.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- Store in a cool, dry, well-ventilated area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

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 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].

continued...

AMC PENETROL XTRA

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

CHEMWATCH 7639-46
Version No:4.1.1.1
Page 4 of 6

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

HANDS/FEET

■ The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

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

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

Dark amber viscous liquid with a slight ammoniacal odour; slightly mixes with water.

PHYSICAL PROPERTIES

Liquid.

Mixes with water.

State	Liquid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Applicable	Viscosity	Not Available
Boiling Range (°C)	Not Available	Solubility in water (g/L)	Miscible
Flash Point (°C)	210	pH (1% solution)	Not Available
Decomposition Temp (°C)	Not Available	pH (as supplied)	8.5- 9.0
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	0.95
Lower Explosive Limit (%)	Not Available	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.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

continued...

AMC PENETROL XTRA

Hazard Alert Code: LOW

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

CHEMWATCH 7639-46
Version No:4.1.1.1
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Section 11 - TOXICOLOGICAL INFORMATION

ACUTE HEALTH EFFECTS

SWALLOWED

■ Although ingestion is not thought to produce harmful effects (as classified under EC Directives), the material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health).

EYE

■ Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

SKIN

■ The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

INHALED

■ The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

TOXICITY AND IRRITATION

■ Not available. Refer to individual constituents.

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 PENETROL XTRA	No Data Available	No Data Available		

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:

None (ADG7)

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

continued...

AMC PENETROL XTRA

Chemwatch Material Safety Data Sheet
Issue Date: 23-Aug-2011
X9317SP

Hazard Alert Code: LOW

CHEMWATCH 7639-46
Version No:4.1.1.1
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Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE None

REGULATIONS

No data for AMC PENETROL XTRA (CAS: , None, Not avail)

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.

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Issue Date: 23-Aug-2011

Print Date: 21-Aug-2012

This is the end of the MSDS.

AMC Soda Ash

Chemwatch Material Safety Data Sheet (REVIEW)

Issue Date: 15-Jan-2013

X9317SP

Hazard Alert Code: HIGH

CHEMWATCH 4785-74

Version No:3.1.1.1

Page 1 of 8

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

AMC Soda Ash

SYNONYMS

"sodium carbonate"

PRODUCT USE

Drilling fluid additive.

SUPPLIER

Company: AMC.

Address:

5 Pitino Court

Osborne Park

WA, 6017

Australia

Telephone: +61 8 9445 4000

Emergency Tel: **+61 419 258 730**

Fax: +61 8 9445 4040

Company: AMC.

Address:

PO Box 1141

Osborne Park

WA, 6916

Australia

Telephone: +61 8 9445 4000

Emergency Tel: **+61 419 258 730**

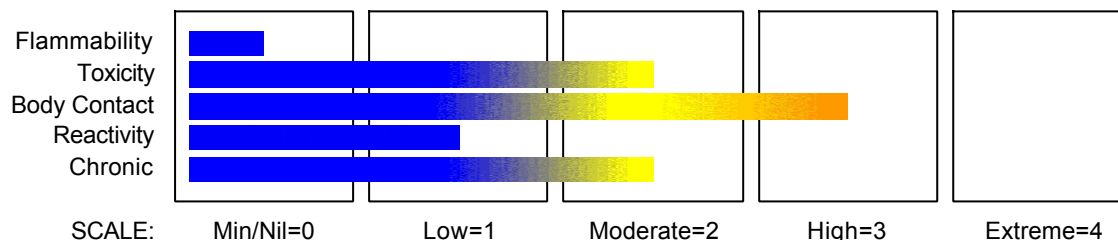
Fax: +61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

CHEMWATCH HAZARD RATINGS



RISK

- Harmful by inhalation.
 - Irritating to eyes, respiratory system and skin.
 - Cumulative effects may result following exposure*.
- *(limited evidence).

SAFETY

- Do not breathe dust.
- Avoid contact with skin.
- Avoid contact with eyes.
- Wear suitable protective clothing.
- Wear suitable gloves.
- Wear eye/face protection.
- Use only in well ventilated areas.
- Keep container in a well ventilated place.
- To clean the floor and all objects contaminated by this material, use water.
- Keep away from food, drink and animal feeding stuffs.
- In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.

continued...

AMC Soda Ash

Hazard Alert Code: HIGH

Chemwatch Material Safety Data Sheet (REVIEW)

Issue Date: 15-Jan-2013

X9317SP

CHEMWATCH 4785-74

Version No:3.1.1.1

Page 2 of 8

Section 2 - HAZARDS IDENTIFICATION

- If swallowed, IMMEDIATELY contact Doctor or Poisons Information Centre. (show this container or label).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
sodium carbonate	497-19-8	>60

Section 4 - FIRST AID MEASURES

SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

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 contact occurs:
 - Immediately remove all contaminated clothing, including footwear.
 - Flush skin and hair with running water (and soap if available).
 - Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

NOTES TO PHYSICIAN

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

- Respiratory stress is uncommon but present occasionally because of soft tissue edema.
- Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
- Oxygen is given as indicated.
- The presence of shock suggests perforation and mandates an intravenous line and fluid administration.

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 in the event of a fire.
- 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.

continued...

AMC Soda Ash

Hazard Alert Code: HIGH

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Section 5 - FIRE FIGHTING MEASURES

Decomposes on heating and produces acrid and toxic fumes of: carbon monoxide (CO), carbon dioxide (CO₂), metal oxides, other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM

None

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.

MAJOR SPILLS

Moderate hazard.

- CAUTION: Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions)
- Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.
- Establish good housekeeping practices.
- Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds.

SUITABLE CONTAINER

- DO NOT use aluminium or galvanised containers.
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

Sodium carbonate:

- aqueous solutions are strong bases
- reacts violently with finely divided aluminium, fluorine, lithium, phosphorus pentoxide, sulfuric acid
- reacts with fluorine gas at room temperature, generating incandescence.
- is incompatible with organic anhydrides, acrylates, alcohols, aldehydes, alkylene oxides, substituted allyls, cellulose nitrate, cresols, caprolactam solution, epichlorohydrin, ethylene dichloride, isocyanates, ketones, glycols, nitrates, phenols, phosphorus pentoxide 2,4,6-trinitrotoluene.
- Metals and their oxides or salts may react violently with chlorine trifluoride and bromine trifluoride.
- These trifluorides are hypergolic oxidisers. They ignites on contact (without external source of heat or ignition) with recognised fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition.

continued...

AMC Soda Ash

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Section 7 - HANDLING AND STORAGE

- The state of subdivision may affect the results.
- In presence of moisture, the material is corrosive to aluminium, zinc and tin producing highly flammable hydrogen gas.
- Avoid strong acids, acid chlorides, acid anhydrides and chloroformates.
- Avoid contact with copper, aluminium and their alloys.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry area protected from environmental extremes.
- 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

- sodium carbonate:

CAS:497- 19- 8 CAS:7542- 12- 3

MATERIAL DATA

AMC SODA ASH:

SODIUM CARBONATE:

It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience).

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

AMC SODA ASH:

SODIUM CARBONATE:

Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations.

SODIUM CARBONATE:

OEL STEL: (Russia) 5 mg/m³

PERSONAL PROTECTION



RESPIRATOR

- Particulate. (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

- The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

continued...

AMC Soda Ash

Hazard Alert Code: HIGH

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.

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

White hygroscopic odourless powder / granular mildly alkaline solid: mixes with water (215 g/l, 20 C; 45.5 g/100 ml, 100 C).

Soluble in glycerol and slightly soluble in alcohol. Bitter alkaline taste. On exposure to air, will gradually absorb one mole of water. Typical bulk density 60-65 lbs/cft

There are two forms of sodium carbonate available, light soda and dense soda. Impurities of sodium carbonate may include water (< 1.5 %), sodium chloride (< 0.5 %), sulphate (< 0.1 %), calcium (< 0.1 %), magnesium (< 0.1 %) and iron (< 0.004 %). The purity and the impurity profile depends on the composition of the raw materials, the production process and the intended use of the product. For example the purity of the pharmaceutical grade must be higher than 99.5 % in Europe

The average particle size diameter (d50) of light sodium carbonate is in the range of 90 to 150 um and of dense sodium carbonate is in the range of 250 to 500 um.

PHYSICAL PROPERTIES

Solid.

Mixes with water.

Alkaline.

State	Divided solid	Molecular Weight	106
Melting Range (°C)	851	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Miscible
Flash Point (°C)	Not Applicable	pH (1% solution)	11.3
Decomposition Temp (°C)	>400	pH (as supplied)	Not Available
Autoignition Temp (°C)	Not Applicable	Vapour Pressure (kPa)	Not Applicable
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	2.53 @ 20 C
Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Applicable	Evaporation Rate	Not Applicable

Section 10 - STABILITY AND REACTIVITY

CONDITIONS CONTRIBUTING TO INSTABILITY

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

continued...

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

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum.

EYE

■ Alkaline salts may be intensely irritating to the eyes and precautions should be taken to ensure direct eye contact is avoided. There is evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Severe inflammation may be expected with pain. There may be damage to the cornea. Unless treatment is prompt and adequate there may be permanent loss of vision. Conjunctivitis can occur following repeated exposure.

SKIN

■ The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering. Open cuts, abraded or irritated skin should not be exposed to this material. Solution of material in moisture on the skin, or perspiration, may markedly increase skin corrosion and accelerate tissue destruction. Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. Contact with concentrated solutions of sodium carbonate may cause tissue damage - "soda ulcers".

INHALED

■ Inhalation of dusts, generated by the material, during the course of normal handling, may be harmful. The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled. If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures. Inhalation of sodium carbonate may cause coughing, sore throat, difficulty breathing. Fluid accumulation in the lungs can occur with exposure to high doses or over a long period of time.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray. Long term inhalation of sodium carbonate may result in nose damage and lung disease.

TOXICITY AND IRRITATION

■ Not available. Refer to individual constituents.

SKIN

sodium carbonate	GESAMP/EHS Composite List - GESAMP Hazard Profiles	D1: skin irritation/corrosion	1
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Section 12 - ECOLOGICAL INFORMATION

No data

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
sodium carbonate	LOW	No Data Available	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

Indications of Danger:

Xn Harmful

POISONS SCHEDULE

None

REGULATIONS

Regulations for ingredients

sodium carbonate (CAS: 497-19-8, 7542-12-3) is found on the following regulatory lists;

"Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "Australia National Pollutant Inventory", "Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix C", "Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix E (Part 2)", "Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix F (Part 3)", "Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5", "Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6", "CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless Otherwise Specified, in Accordance with GMP", "FisherTransport Information", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "International Council of Chemical

continued...

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Section 15 - REGULATORY INFORMATION

Associations (ICCA) - High Production Volume List", "International Numbering System for Food Additives", "OECD List of High Production Volume (HPV) Chemicals", "Sigma-AldrichTransport Information"

No data for AMC Soda Ash (CW: 4785-74)

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
sodium carbonate	497-19-8, 7542-12-3

■ 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.

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This is the end of the MSDS.



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AMC WA-131

Chemwatch Material Safety Data Sheet
Issue Date: 8-Aug-2011
X9317SP

Hazard Alert Code: MODERATE

CHEMWATCH 24-1937
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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
AMC WA-131

PRODUCT USE
Drilling fluid additive.

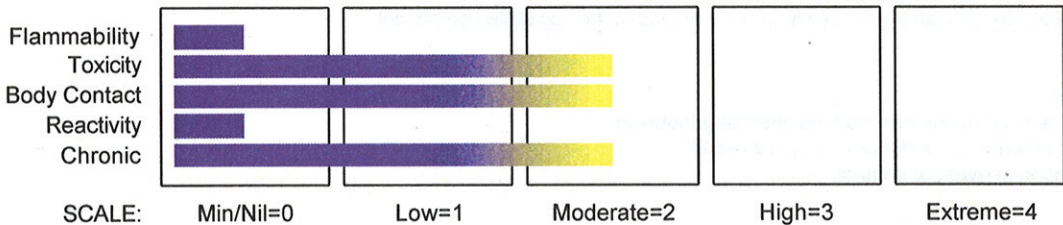
SUPPLIER
Company: AMC
Address:
5 Pitino Court
Osborne Park
WA, 6017
Australia
Telephone: 61 8 9445 4000
Emergency Tel:**1800 039 008**
Emergency Tel:**+800 2436 2255**
Fax: 61 8 9445 4040

Company: AMC
Address:
PO Box 1141
Osborne Park
WA, 6916
Australia
Telephone: 61 8 9445 4000
Emergency Tel:**1800 039 008**
Emergency Tel:**+800 2436 2255**
Fax: 61 8 9445 4040

Section 2 - HAZARDS IDENTIFICATION

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

CHEMWATCH HAZARD RATINGS



RISK
Risk Codes
R20/22
R36/37/38
R33?

Risk Phrases
• Harmful by inhalation and if swallowed.
• Irritating to eyes, respiratory system and skin.
• Cumulative effects may result following exposure*.

SAFETY
Safety Codes
S22
S24

Safety Phrases
• Do not breathe dust.
• Avoid contact with skin.

continued...

Section 2 - HAZARDS IDENTIFICATION

- S25 • Avoid contact with eyes.
- S36 • Wear suitable protective clothing.
- S37 • Wear suitable gloves.
- S39 • Wear eye/face protection.
- S51 • Use only in well ventilated areas.
- S09 • Keep container in a well ventilated place.
- S40 • To clean the floor and all objects contaminated by this material, use water.
- S13 • Keep away from food, drink and animal feeding stuffs.
- S26 • In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.
- S46 • If swallowed, IMMEDIATELY contact Doctor or Poisons Information Centre. (show this container or label).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
blend of inhibitive and non- corrosive salts		>95

Section 4 - FIRST AID MEASURES

SWALLOWED

- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- For advice, contact a Poisons Information Centre or a doctor.
- Urgent hospital treatment is likely to be needed.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.

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 contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear breathing passages.
- Ask patient to rinse mouth with water but to not drink water.
- Seek immediate medical attention.

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

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.

MAJOR SPILLS

- Moderate hazard.
- CAUTION: Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

SUITABLE CONTAINER

15 kg plastic drums.

STORAGE INCOMPATIBILITY

- None known.

STORAGE REQUIREMENTS

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

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

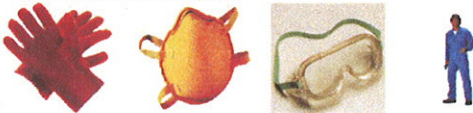
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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

MATERIAL DATA

AMC WA-131:
Not available

PERSONAL PROTECTION**RESPIRATOR**

•Particulate. (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

- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
 - frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexterity.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.

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

White deliquescent odourless granules or crystalline powder; soluble in water.

PHYSICAL PROPERTIES

Mixes with water.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

State	Divided Solid	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Miscible
Flash Point (°C)	Not Applicable	pH (1% solution)	7.0- 8.5
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not Applicable
Autoignition Temp (°C)	Not Applicable	Vapour Pressure (kPa)	Not Applicable
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	Not Available
Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Applicable

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

SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

EYE

- This material can cause eye irritation and damage in some persons.

SKIN

- This material can cause inflammation of the skin oncontact in some persons. The material may accentuate any pre-existing dermatitis condition. Open cuts, abraded or irritated skin should not be exposed to this material.

INHALED

- Inhalation of dusts, generated by the material, during the course of normalhandling, may be harmful. The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled. If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.

CHRONIC HEALTH EFFECTS

- Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.

TOXICITY AND IRRITATION

- Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound.

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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 WA- 131	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 or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.

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

No data for AMC WA-131 (CW: 24-1937)

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.

continued...

AMC WA-131

Chemwatch Material Safety Data Sheet
Issue Date: 8-Aug-2011
X9317SP

Hazard Alert Code: MODERATE

CHEMWATCH 24-1937
Version No:2.0
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Section 16 - OTHER INFORMATION

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Issue Date: 8-Aug-2011
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This is the end of the MSDS.



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AMC XAN-BORE

Chemwatch Material Safety Data Sheet
Issue Date: 7-May-2009
X9317SP

Hazard Alert Code: LOW

CHEMWATCH 7177-15
Version No:3.1.1.1
Page 1 of 7

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
AMC XAN-BORE

PRODUCT USE
Drilling fluids compound; drilling viscosifier.

SUPPLIER

Company: AMC
Address:
PO Box 1141
Osborne Park
WA, 6916
Australia
Telephone: 61 8 9445 4000
Emergency Tel: 1800 039 008 or +613 9573 3112
Emergency Tel: +800 24 36 22 55
Fax: 61 8 9445 4040

Company: AMC
Address:
5 Pitino Court
Osborne Park
WA, 6017
Australia
Telephone: +61 8 9445 4000
Emergency Tel: 1800 039 008 or +61 3 9573 3112
Emergency Tel: +800 24 36 22 55
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



RISK

•None under normal operating conditions.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
gum xanthan	11138-66-2	100

continued...

AMC XAN-BORE

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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 dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

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 in the event of a fire.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.

FIRE/EXPLOSION HAZARD

- Solid which exhibits difficult combustion or is difficult to ignite.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.
- Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited; once initiated larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM

None

continued...

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Wear impervious gloves and safety glasses.
- Use dry clean up procedures and avoid generating dust.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact with the substance, by using protective equipment and dust respirator.
- 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.
- Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions)
- Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.
- Establish good housekeeping practices.
- Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds.

SUITABLE CONTAINER

- Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum.
- Packing as recommended by manufacturer.

STORAGE INCOMPATIBILITY

- Avoid contamination of water, foodstuffs, feed or seed.
- Avoid reaction with oxidising agents.

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

- gum xanthan:

CAS:11138- 66- 2

PERSONAL PROTECTION

continued...

AMC XAN-BORE

Hazard Alert Code: LOW

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION



RESPIRATOR

•Particulate. (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

■ The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc.

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

Tan granular solid; partly soluble in water.

PHYSICAL PROPERTIES

State	Divided Solid	Molecular Weight	Not Available
Melting Range (°C)	Not Available	Viscosity	Not Applicable
Boiling Range (°C)	Not Applicable	Solubility in water (g/L)	Partly Miscible
Flash Point (°C)	Not Applicable	pH (1% solution)	4.7
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not Applicable
Autoignition Temp (°C)	Not Applicable	Vapour Pressure (kPa)	Not Applicable

continued...

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	~0.65
Lower Explosive Limit (%)	Not Applicable	Relative Vapour Density (air=1)	Not Applicable
Volatile Component (%vol)	Not Applicable	Evaporation Rate	Not Applicable

Section 10 - STABILITY AND REACTIVITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Product is considered stable and 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

SWALLOWED

- Although ingestion is not thought to produce harmful effects (as classified under EC Directives), the material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health).

EYE

- Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

SKIN

- The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

INHALED

- The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

CHRONIC HEALTH EFFECTS

- Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course. Studies indicate that diets containing large amounts of non-absorbable polysaccharides, such as cellulose, might decrease absorption of calcium, magnesium, zinc and phosphorus. Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung.

TOXICITY AND IRRITATION

- Not available. Refer to individual constituents.

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

continued...

AMC XAN-BORE

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Section 12 - ECOLOGICAL INFORMATION

gum xanthan	No Data Available	No Data Available
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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

gum xanthan (CAS: 11138-66-2,"Not avail") is found on the following regulatory lists;

"Australia Inventory of Chemical Substances (AICS)", "CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless Otherwise Specified, in Accordance with GMP", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD List of High Production Volume (HPV) Chemicals"

No data for AMC XAN-BORE (CAS: , None, Not avail)

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS	
gum xanthan	11138-66-2,	"Not avail"

■ 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

continued...

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Section 16 - OTHER INFORMATION

the reported Hazards are Risks in the workplace or other settings.

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Issue Date: 7-May-2009
Print Date: 21-Aug-2012

This is the end of the MSDS.

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 New Zealand	1800-127406 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 vomiting 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 until 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, alkali 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 emits 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 CaCl₂ (or) CaCl₂.2H₂O

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% H2O 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 or 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/cm ³ 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, alkali 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.
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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 Degradability	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 Class	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 (CaCl ₂)
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. LC ₅₀ 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. LD ₅₀ 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 million per 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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 Melbourne Hawke's Bay
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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.

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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: Safe handling advice:	No special precautions required. 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 (Skeletonea 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

The information and recommendations contained herein are based upon tests believed to be reliable. However, Schlumberger does not guarantee their accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage may be required. Schlumberger assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

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

R20/21/22: Harmful by inhalation, in contact with skin and if swallowed.

R36/37/38: Irritating to eyes, respiratory system and skin.

R43: May cause sensitisation by skin contact.

R66: Repeated exposure may cause skin dryness or cracking.

Safety Phrases

S22: Do not breathe dust.

S24/25: Avoid contact with skin and eyes.

S29: Do not empty into drains.

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 ₂ O)	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.
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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.
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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.
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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.
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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.
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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.
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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:	<p>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.</p> <p>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).</p> <p>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.</p>

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
Emergency Contact Number:	Contact Person: Technical Manager 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.