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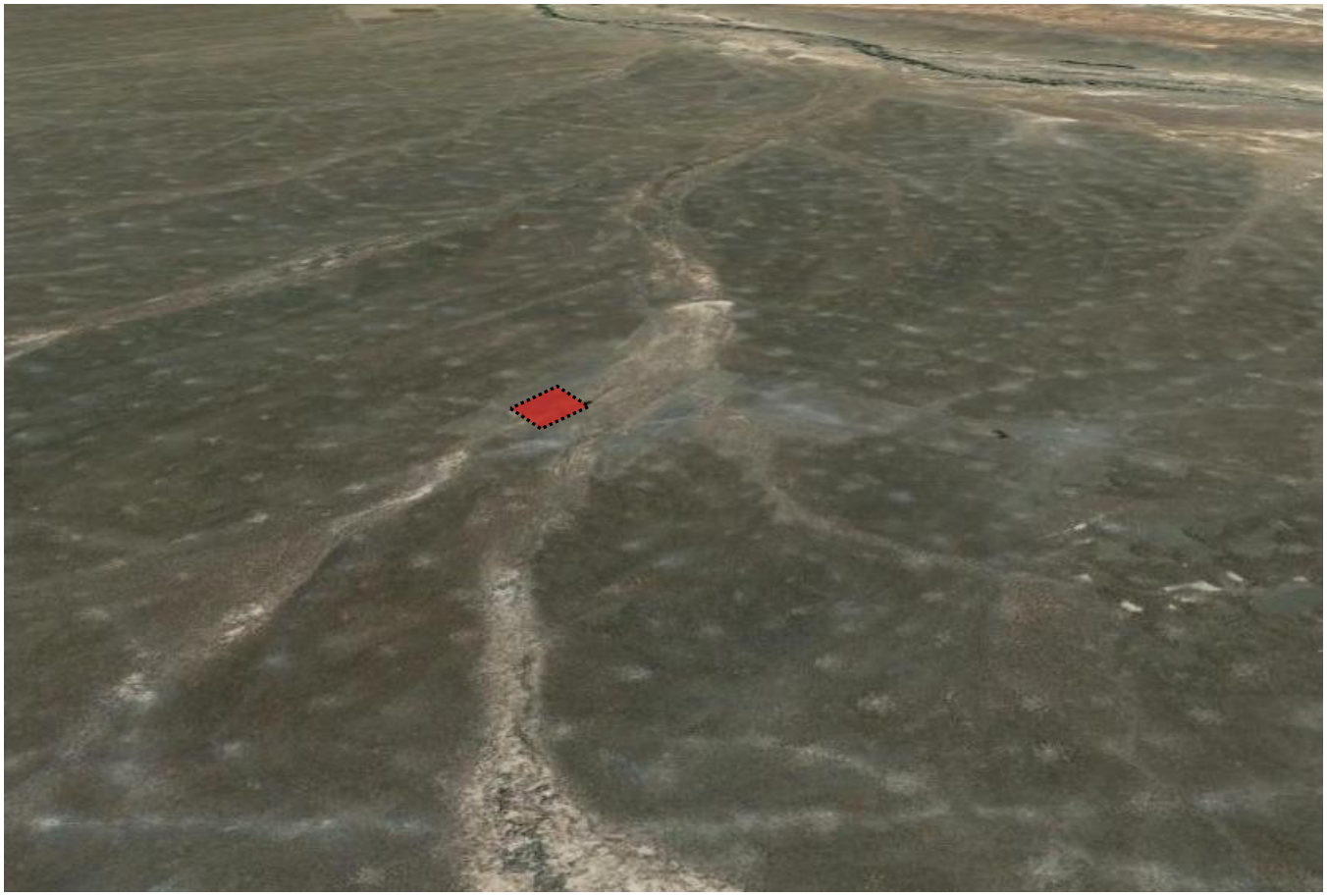
CIMERA – KARIN PROJECT

ECO CHECKLIST # 2

ECO SERVICES FOR THE DRILLING OF A RESEARCH BOREHOLE ON FARM ZANDFONTEIN NO. 89, CERES DISTRICT, WESTERN CAPE: PLANNING, OPERATION AND REHABILITATION PHASE.



PREPARED FOR: UNIVERSITY OF JOHANNESBURG
DRILLING CONTRACTOR: GEOSERVE

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DATE OF SITE VISIT(S): 07/08/2015 **DATE OF ISSUE: 12/08/2015**

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LIST OF ACRONYMS AND ABBREVIATIONS

CIMERA	Centre of Excellence for Integrated Mineral and Energy Resource Analysis
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EMP	Environmental Management Plan
KARIN	Karoo Research Initiative
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SRU	Solid Removal Unit
UJ	University of Johannesburg
WEC	Withers Environmental Consultants

AIM	ACTION TO BE CHECKED BY ECO[1]	RESP[2]	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
PHASE 1: PLANNING					
1.1 Actions to be undertaken prior to the commencement of drilling					
Awareness of possible impacts, hazards and the mitigation measures required	Induction of personnel to be undertaken by ECO prior to the commencement of drilling.	ECO	ECO, GEOSERVE	N	Site personnel were inducted on 17 July 2015, prior to the commencement of drilling. An information board, containing the on-site conduct rules and the induction sheet (provided by Withers Environmental Consultants) is situated at the site entrance. The board also contains information on snake identification and on scene first aid procedures.
	A copy of the approved Environmental Management Plan (EMP) by AGES of 18 June 2015 must be present on-site during the planning, operation and rehabilitation phases.	GEOSERVE	GEOSERVE, UJ	N	A copy of all the relevant documentation, including the approved Environmental Management Plan (EMP) by AGES of 18 June 2015, is kept on site. A copy of the first ECO Checklist is also kept on site.
Establishment of appropriate services for the duration of the drilling	Appropriate, energy saving lights should be installed at the drill site (yellow lights, which do not attract insects). Lights should be faced in a downward position. Only necessary lighting should be used at night.	GEOSERVE	GEOSERVE; ECO	N	Appropriate energy saving lights has been installed at the necessary locations. The designated smoking area has been fitted with a solar powered light.
Adequate demarcation	The site should be appropriately demarcated to a 50m X 50m fenced area, as indicated in the EMP. The materials lay down area should be established in the already disturbed area near the old agricultural fields.	GEOSERVE	GEOSERVE; UJ	N	Appropriate signage has been erected at the farm entrance. The site has been appropriately demarcated with a security fence and safety netting. The methane burnout pit on the edge of the site has been demarcated with the appropriate safety netting.

[1] Environmental Control Officer
[2] Responsibility

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
PHASE 2: OPERATION					
2.1 Air quality and noise					
Prevention of air pollution	The speed of vehicles to and from the drilling site should be kept as low as possible to reduce the generation of dust. If deemed necessary by the ECO, the access road to the site should be kept moist. The number of vehicles using the access road should be kept to the bare minimum.	GEOSERVE	GEOSERVE, UJ; ECO	N	This was explained to the contractors during the environmental site induction on 17 July 2015. Appropriate signage has been erected at the farm entrance which indicates the speed limit to be adhered to on the property.
Prevention of excessive noise	No loud music may be played on site.	GEOSERVE	GEOSERVE, UJ; ECO	N	This was explained during the environmental site induction on 17 July 2015.
	Drilling machinery must be fitted with noise mufflers and be maintained in good working order. Noise levels must to conform to the OSH Act.	GEOSERVE	GEOSERVE; UJ; ECO	N	The noise levels of operating machinery are in compliance with the OSH act. Noise level measurements of drilling machinery being used on site were shown to the ECO indicating its compliance.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.2 Site access					
Maintenance of access roads	Existing access roads should be used. No new roads are to be made. Access roads should be maintained by GEOSERVE. Areas prone to water logging must be maintained using local road materials.	GEOSERVE	GEOSERVE, UJ; ECO	Once drilling has been completed	Sections of both of the access roads have started forming ruts due to the frequent use of construction vehicles (which was checked during the site visits of 24 July 2015 and 11 August 2015). As a temporary solution, Geoserve personnel are currently experimenting flattening the ruts by manual raking (**Photos 1a and 1b**). As manual raking is a time consuming process, we suggest that Geoserve personnel flatten the ruts which have formed on the access roads, once drilling has been completed by: • Filling two used tyre casings with concrete; • attaching the filled tyres to a suitable 4X4 vehicle with rope; and • dragging the two filled tyres over the access road tracks and across the ruts to level them out. Geoserve personnel (one person per tyre) should walk behind and guide the tyres by an attached rope to the back of the tyre in order to prevent flattening of vegetation occurring on the "middelmannetjie" of the "twee-spoor" road. Two passes over the ruts will probably be sufficient. Areas prone to water logging should be regularly checked and maintained, if necessary, using local materials to prevent them from destabilising.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.3 Conduct of personnel					
Proper conduct of personnel must be exercised	No personnel are allowed outside of the demarcated drilling and site areas. No personnel may trespass onto other properties.	GEOSERVE	GEOSERVE, UJ; ECO	N	This was explained during the environmental site induction on 17 July 2015.
	Drilling may take place 24 hours a day, with two teams working 12 hour shifts. No drilling may occur on a Sunday. Should drilling at night become a nuisance to nearby neighbours, alternative drilling hours should be agreed to.	GEOSERVE	GEOSERVE, UJ; ECO	N	Drilling is currently taking place 24 hours a day (except Sundays), with two teams working 12 hour shifts. Drilling was halted during the site visit on 24 July 2015 as the drilling hole had been grouted with concrete ("cased off") (at a depth of approximately 45m). Drilling at night was halted during a cold spell (towards the end of July/early August). Drilling has since commenced, and reached a depth of approximately 365m during the site visit on 7 August 2015.
Health and safety of personnel	The contractor should ensure that adequate Personal Protective Equipment (PPE) is provided to personnel (including the necessary noise protection gear).	GEOSERVE	GEOSERVE, UJ	N	Personal Protective Equipment (PPE) is provided for each staff member and stored in the construction trailer which doubles as a first aid room. All personnel were observed to be using their PPE.
2.4 Prevention of fires					
Prevention of fires and burning	Two (2) fire extinguishers should be present on site at all times. Fire extinguishers should be checked (and recorded) annually and be in good working order.	GEOSERVE	GEOSERVE; ECO	N	At least 5 fire extinguishers are present on site at all times (fire extinguishers are present at every fire hazard potential area). All on site fire extinguishers have been serviced for 2015 (next service due in May 2016) and are properly pressurised.
	No burning of waste or cleared vegetation is allowed on site.	GEOSERVE	GEOSERVE; UJ: ECO	N	This was explained during the environmental site induction on 17 July 2015. All waste is stored in appropriate bins.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.4 Prevention of fires (cont.)					
Prevention of fires and burning (cont.)	No open flames are allowed on site, including the use of fires for cooking or heating at or near the drilling site.	GEOSERVE	GEOSERVE, UJ	N	This was explained during the environmental site induction on 17 July 2015 and is being adhered to.
	No smoking is allowed near the drill rig, but only in specific demarcated areas. Cigarette butts are to be disposed of in a lidded bin.	GEOSERVE	GEOSERVE, UJ; ECO	N	A designated smoking area has been allocated, away from the drilling area.
2.5 Removal of vegetation					
Prevention of excessive removal of vegetation	Removal of vegetation should be limited to the drill site only. Search and rescue of succulents must be undertaken and planted away from the drill site. Any brushwood should be stored for later site rehabilitation. No dead brushwood should be collected.	GEOSERVE	ECO to supervise with personnel of GEOSERVE	N	This was explained during the environmental site induction on 17 July 2015. Several Jessop *Drimia marginata* and *Gladiolus* spp. were located on site and transplanted by the ECO during the site visit of 24 July 2015 within a nursery area for later transplanting back to the site. Seeds from surrounding indigenous Tankwa Karoo Succulent Karoo vegetation are collected during each site visit and will be stored for use in the rehabilitation of the drill site.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.6 Water contamination and use					
Prevention of water loss and waste of water through leaks	Cement grout should be used to avoid water losses within the borehole, should the contractor encounter fractured zones.	GEOSERVE	GEOSERVE; UJ	N	No drilling was in progress on 24 July 2015 as the drill hole had been grouted with concrete to "case-off" the borehole (and the fracture zone at about 35m). No water losses were noted, despite a large fracture zone being intersected at about 35m. This fracture zone appeared to yield groundwater. The concrete grout has "cased-off" this fracture zone to prevent any contamination of this potential groundwater zone. By any groundwater strikes deeper down. A second fracture zone was encountered at a depth of approximately 250m, which did not appear to yield groundwater. This fracture zone was not cased off. As this fracture zone was causing a large water loss, a mixer unit (**Photo 2a**) was put into use which mixes the following substances (**Photo 2b**) with the extracted borehole water, forming a thick, viscous muddy solution, which decreases the amount of water lost during the drilling: • Ezee-Pac R, a natural base, highly dispersive polyanionic cellulose polymer which is used for increasing viscosity of the drilling water by forming a protective colloid which inhibits the hydration of water and reduces the friction of the drilling rods against the rock; • soda ash, which is used to increase the pH of the solution (the ideal pH for the muddy solution is between 8.5 and 9); and • Ezee-Pac L, a non-toxic, environmentally friendly polyanionic cellulose polymer which forms a protective colloid envelope over the clay and shale surfaces which inhibits the hydration and prevents water filtration into fracture zones. The safety data sheets for Ezee-Pac R, the soda ash and Ezee-Pac L have been added to this checklist as **Appendices B**, **C** and **D**, respectively.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.6 Water contamination and use (cont.)					
Prevention of water loss and waste of water through leaks	Water is a precious resource and must be used sparingly; no water may be wasted on site. Water pipes and connections should be checked regularly, and any leaking water pipes / connections should be repaired as soon as possible.	GEOSERVE	GEOSERVE; ECO	N	No wastage of water was noted on-site. Water is sourced from a nearby borehole through a PVC pipe laid out on surface to the drill site. About 3000 litres of groundwater per day is pumped to the mixing unit, a Solid Removal Unit (SRU) and into three small "reservoirs". Drilling mud (sludge) from the borehole is circulated by pumping to the SRU.
	Water is a precious resource and must be used sparingly.	GEOSERVE	GEOSERVE	N	
Prevention of groundwater or surface water contamination	No contaminants (soaps, detergents, lime, glues, paints, cement or fuels) may be discharged into the borehole or any drainage systems.	GEOSERVE	GEOSERVE; UJ; ECO	N	No water loss was recorded before the intersection of the fracture at approximately 250m in depth. The 250m fracture intersection caused approximately 1500l of water loss per day. A mixing unit is currently being used which mixes Ezee-Pac R, Ezee-Pac L and soda ash with the extracted borehole water, forming a viscous muddy solution which reduces the amount of water lost within the fracture zone during the drilling process (see above for details). Solids from the drilling process are sorted and removed (through centrifugal and shaking action) and sludge is dewatered and extracted in the SRU and falls into a large plastic bag which is temporarily stored in a trailer lined with plastic and is currently being stockpiled adjacent to the trailer (**Photo 3**). The drill sludge is scheduled to be transported to Johannesburg on Monday 17th of August, 2015, where it will be tested for any contaminants by ECO Nutria. The remaining cleaned water is recycled back to the borehole. The returning water is tested for its chemical constituents. The chemical composition of the returned drilling water must be made available to the ECO, which will be included in our final ECO Checklist (Audit).

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.7 Waste management					
Adequate disposal of solid waste	Excess drilling mud must be stored in steel storage tanks may only be disposed of at a licenced Municipal landfill sites.	GEOSERVE	GEOSERVE; ECO	N	Receipts from licenced Municipal landfill sites must be kept on site, if applicable. Drilling sludge collected from the SRU is temporarily stored in a trailer lined with plastic and is currently being stockpiled adjacent to the trailer (**Photo 3**). Drilling sludge was scheduled to be collected and disposed of by Enviroserve[3]. As the drill sludge is currently being stockpiled on site, Geoserve is scheduled to transport it to Johannesburg on Monday the 17th of August, 2015, where it will be tested for any contaminants by ECO Nutria. A certificate of proper disposal should be provided by ECO Nutria to be included in our final ECO Checklist (Audit).

[3] During the site visit of 07 August 2015, Geoserve indicated that representatives from Enviroserve did not arrive at the site to remove the drill sludge.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.7 Waste management (cont.)					
Adequate disposal of solid waste	The site should be kept neat and tidy. Any solid waste generated on site (including plastic, drilling sludge, waste cement grout etc.) must be kept in adequate waterproof containers. Solid waste must be disposed of weekly (at an approved Municipal landfill site) to prevent a build-up on site.	GEOSERVE	GEOSERVE; ECO	N	Receipts from licenced Municipal landfill sites must be kept on site, if applicable. The contractor is commended on the neatness and layout of the drilling of the site. Solid waste generated on site is neatly separated and marked in adequate containers. Recyclables are sorted on site and put into separate bins.
	Sludge generated by the drilling process should be suitably stored in a leach proof container and be removed by Enviroserve, or transported to an Enviroserve depot for disposal at an appropriate licenced landfill site.	GEOSERVE	GEOSERVE; UJ; ECO	N	The sludge extracted from the borehole (via the SRU) is stored appropriately on site. Geoserve is scheduled to transport the accumulated drill sludge to Johannesburg on Monday the 17th of August, 2015, where it will be tested for any contaminants by ECO Nutria. A certificate of proper disposal should be provided by ECO Nutria to be included in our final ECO Checklist (Audit).
Adequate storage of litter	Lidded, scavenger proof waste bins should be provided for the staff at their living camp and on the drill site and should be removed with other solid waste on a weekly basis at a licenced Municipal landfill site.	GEOSERVE	GEOSERVE, UJ; ECO	N	Solid waste generated on site is neatly separated and marked in appropriate containers.
	Designated eating areas should be provided and appropriate bins provided for litter.	GEOSERVE	GEOSERVE, UJ; ECO	N	A tent has been erected on-site which serves as a designated eating/recreational area for drilling staff.
2.8 Prevention of erosion					
Prevention of soil erosion	Appropriate stabilisation and soil protection measures should be implemented to prevent erosion occurring, especially where the access road to the drill site crosses small streams and clayey pans.	GEOSERVE	GEOSERVE; ECO	N	Access road areas prone to water logging should be regularly checked and maintained, if necessary, using local materials to prevent them from destabilising. This has currently not been necessary as only 2mm of rain has been recorded.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.9 Sanitation provision					
Implementation of proper sanitation	One (1) portable chemical toilet should be provided for every fifteen (15) workers. Toilet paper should be provided by the contractor.	GEOSERVE	GEOSERVE; ECO	N	A mobile toilet unit (from Fancy Flush) is situated adjacent to the site. The unit contains two toilets (adequate for the amount of on-site personnel during each shift).
	Portable chemical toilets should be emptied once per week by the appropriate contractor.	GEOSERVE	GEOSERVE; ECO	N	Service receipts must be kept on site.
	Portable chemical toilets should be placed in a suitable location, on even ground, be appropriately secured to prevent being blown over and may not be closer than 100m from a drainage line.	GEOSERVE	GEOSERVE; ECO	N	The mobile toilet is parked on level ground, and is also secured by plastic tyre chocks.
2.10 Vehicle and machinery management					
Prevention of fuel, oil and / or lubricant spills / leaks.	No vehicles may be extensively repaired on site. Vehicle and machinery maintenance should be undertaken in a maintenance yard of a farm homestead.	GEOSERVE	GEOSERVE, UJ	N	This was explained during the environmental site induction on 17 July 2015.
	Vehicle and machinery should be checked, serviced and maintained daily to prevent fuel, oil and / or lubricant spills / leaks. Immediate action should be taken by the contractor should any machinery or vehicle be seen to be leaking fuel or oils, by placing a drip tray beneath the leak. Any spills / leaks should be reported to the ECO. Contaminated soil must be picked up in the appropriate manner and stored in a watertight bin for removal to the hazardous waste site at Vissershok, Cape Town.	GEOSERVE	GEOSERVE, UJ; ECO	N	Receipts of dumping contaminated soils at Vissershok hazardous landfill site must be kept on site. This has not been necessary to date. A spill kit is present on site, which will be used in the event of a fuel, oil or lubricant spill. Any contaminated soil will be rehabilitated with Terrasweep and Terrafix and removed from site to Vissershok. Drip trays and/or plastic lining are present beneath all mechanical equipment and stored chemicals. Plastic lining and knitted absorbent socks from the spill kit have been used beneath the SRU (**Photo 4a**) due to a small oil leak. A drip tray and knitted absorbent socks from the spill kit have been used beneath the mobile water pump (**Photo 4b**) to prevent any possible soil contamination.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.10 Vehicle and machinery management (cont.)					
Prevention of fuel, oil and / or lubricant spills / leaks.	Oil must be stored in a bunded area with an impermeable base, which is capable of containing 110% of the volume of oil to be stored. The mobile diesel bowser must be in good working order and its pipes and pump must be leak free.	GEOSERVE	GEOSERVE; ECO	N	A mobile diesel storage unit which is parked on level ground (lined with plastic) and secured with tyre chocks is used.
	Necessary servicing / major repairs of vehicles or machinery must be done at a nearby town. If this is not possible, on site repairs must be overseen by the contractor with the use of a fuel/oil spill kit and the use of drip trays. All fuel / oil contaminated parts must be stored for appropriate disposal in a leak proof container. Used oils must be stored in an appropriate container for disposal or recycling.	GEOSERVE	GEOSERVE, UJ; ECO	N	This was explained during the environmental site induction on 17 July 2015. No servicing or major repairs of vehicles are envisaged to take place on site during the drilling period.
Drilling lubricants	Biodegradable polymers should be used for lubricating and cooling of drill bits and strings. Petroleum free, water based fluids should be used during the drilling process. The use of bentonite clay may also be used as a drilling mud.	GEOSERVE	GEOSERVE; UJ	N	Bordet, a concentrated blend of anionic surfactants is used to reduce torque during the drilling process and clean the bottom-hole assembly (leading to higher rates of drilling penetration). The safety data sheet for Bordet has been added to this checklist as **Appendix E**. Bentonite clay is not being used for the drilling process.
Parking of vehicles and mechanical machinery	Parking areas for the storage of the diesel bowser and the drill machine must be prepared with a plastic liner on top of the soil. The liner should be covered with a thin layer of sand or shaley gravel. Such soil covering is to be removed from site and dumped at an appropriate landfill site when drilling has been completed.	GEOSERVE	GEOSERVE; ECO	N	A mobile diesel storage unit which is parked on level ground (lined with plastic) and secured with tyre chocks is used.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
2.11 Mixing and use of cement					
Prevention of soil contamination by cement	Cement grout or concrete may only be mixed at a suitable mixing location (flat, away from drainage lines) and should be localised to such a location.	GEOSERVE	GEOSERVE; ECO	N	Cement mixing is limited and has been localised close to the drill hole. No drilling was in progress on 24 July 2015 as the drill hole had been concrete grouted. No further concrete grouting has been necessary to date.
	A protective lining (board and / or plastic sheet) should be placed on exposed soils to mix cement.	GEOSERVE	GEOSERVE; ECO	N	
2.12 Fauna and flora protection					
Prevention of harm to fauna	Vehicles should be prevented from speeding to ensure snakes, tortoises and / or other animals are not run over. Any animals encountered on site should not be trapped, snared or killed. Snakes should only be removed off site by a suitably qualified snake handler.	GEOSERVE	GEOSERVE, UJ; ECO	N	This was explained during the environmental site induction on 17 July 2015. Appropriate signage has been erected at the farm entrance which indicates the speed limit to be adhered to on the property.
Prevention of damaging or removing flora	No plants may be damaged or removed without the permission of the ECO. Vehicles must remain on existing roads and may not drive off roads over plants.	GEOSERVE	GEOSERVE; UJ; ECO	N	This was explained during the environmental site induction on 17 July 2015.
2.13 Archaeological and Paleontological management					
Prevention of degradation to any heritage significant material	All works must be halted if any archaeological and / or paleontological remains are found, and must be reported to a Heritage specialist. No personnel may tamper with such finds.	GEOSERVE	GEOSERVE, UJ	N	The area around the drill site revealed no archaeological material. Archaeological hand tools from the area were shown to the staff and they were informed during the environmental site induction on 17 July 2015 not to pick up or remove such material if noted near the site.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
PHASE 3: SITE REHABILITATION					
3.1 Borehole closure					
Ensuring adequate standards are maintained	The contractor should ensure that the borehole is closed (with a lockable steel cap) according to the standards of the Department of Water and Sanitation (DWS), should it need to be used again. If the borehole is not to be used again, it should be closed according to industry standards.	GEOSERVE	GEOSERVE, UJ; ECO	N	This will be done by Geoserve once drilling has been completed, and checked by the ECO during the final site visit (for the final audit report).
3.2 Rehabilitation of drill site and access roads					
Rehabilitation of disturbed areas and damaged access roads	Any disturbed areas must be rehabilitated by scarifying the surface, replanting recued plants; scattering any locally collected seeds (by the ECO). Once rehabilitation has been completed, the area should be lightly sprayed with freshwater if the soils are dry. Any available brushwood (or straw) should be spread over the rehabilitated areas.	GEOSERVE	GEOSERVE	N	Cuttings of various succulent species found around the site were taken and planted in an appropriate on-site location during the site visit of 24 July 2015 by the ECO for later use in rehabilitation. Seeds from surrounding indigenous Tankwa Karoo Succulent Karoo vegetation are collected during each site visit and will be stored for use in the rehabilitation of the drill site. Various bulbs were rescued from the site (e.g Karoo Slangkop. *Ornithoglossum undulatum*) during the site visit of 24 July 2015 by the ECO.

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
3.2 Rehabilitation of drill site and access roads (cont.)					
	Any deterioration of roads and tracks used during the drilling phase should be rehabilitated as soon as possible, to the satisfaction of the property owner and ECO.	GEOSERVE	GEOSERVE	N	Sections of both of the access roads have started forming ruts due to the frequent use of construction vehicles (which was checked during the site visits of 24 July 2015 and 11 August 2015). As a temporary solution, Geoserve personnel are currently experimenting flattening the ruts by manual raking (**Photos 1a and 1b**). As manual raking is a time consuming process, we suggest that Geoserve personnel flatten the ruts which have formed on the access roads, once drilling has been completed by: • Filling two used tyre casings with concrete; • attaching the filled tyres to a suitable 4X4 vehicle with rope; and • dragging the two filled tyres over the access road tracks and across the ruts to level them out. Geoserve personnel (one person per tyre) should walk behind and guide the tyres by an attached rope to the back of the tyre in order to prevent flattening of vegetation occurring on the "middelmannetjie" of the "twee-spoor" road. Two passes over the ruts will probably be sufficient. Areas prone to water logging should be regularly checked and maintained, if necessary, using local materials to prevent them from destabilising.
3.3 Cleaning of drill site					
Ensuring the site is left cleaned	The site should be cleaned in order for it to be reinstated to its original condition. All evidence of oil / diesel spills must be removed in the appropriate manner and such contaminated soils must be dumped at the Vissershok hazardous waste site near Cape Town.	GEOSERVE	GEOSERVE, UJ; ECO	N	This will be undertaken by Geoserve once drilling has been completed, and checked by the ECO during the final site visit (for the final audit report).

AIM	ACTION TO BE CHECKED BY ECO	RESP	ACTION BY	CORRECTIVE ACTION Y/N	COMMENTS
3.3 Cleaning of drill site (cont.)					
Ensuring the site is left cleaned	No waste materials of the drilling process, including any personal belongings of site personnel, tools; bits of machinery; or litter may not be left on site. All such extraneous waste material must be removed to the appropriate licenced landfill site.	GEOSERVE	GEOSERVE, UJ; ECO	N	This will be undertaken by Geoserve once drilling has been completed, and checked by the ECO during the final site visit (for the final audit report).
Ensure that the homestead where staff have stayed is left neat and clean	All waste, including any personal belongings of site personnel, tools; bits of machinery; or litter may not be left on site. All such extraneous waste material must be removed to the appropriate licenced landfill site.	GEOSERVE	GEOSERVE, UJ; ECO	N	

General comments:

1. No corrective action was found to be necessary.
2. The experimental mitigation to ruts by using a rake is time consuming. A more efficient method of using two tyres drawn by a 4X4 vehicle was suggested.
3. The chemical composition of the returned drilling water must be made available to the ECO, which will be included in our final ECO Checklist.
4. The chemical composition of the drill muds, which will be tested by ECO Nutria must be made available to the ECO, along with a proper certificate of disposal to be included in our final ECO Checklist (Audit).
5. A fracture was intersected at 250m which caused a loss of drilling water. To minimise such loss, a mixer unit was put into use which mixes the Ezee-Pac R, soda ash and Ezee-Pac L with the extracted borehole water, forming a thick, viscous muddy solution which is then fed into the drilling water to increase its viscosity. Such activities also decrease friction and cause better penetration of drilling.
6. Bordet is currently used to reduce torque during the drilling process and clean the bottom-hole assembly of rock sludge and bigger rock particles.

Appendix A: Photo Sheet

Photo 1a: Geoserve personnel are currently experimenting flattening ruts which have formed on the access roads by manual raking. As manual raking is a time consuming process, we suggest that Geoserve personnel flatten the ruts by using two tyres drawn by a 4X4 vehicle once drilling has been completed.

Photo 1b: Indication of the flattened ruts due to manual raking.

Photo 2a: The mixer unit (currently in use), which mixes the Ezee-Pac R, soda ash and Ezee-Pac L with the extracted borehole water, forming a thick, viscous muddy solution and decreases the amount of water lost during the drilling.

Photo 2b: Ezee-Pac L (which forms a protective colloid envelope over the clay and shale surfaces), Ezee-Pac R (the polyanionic cellulose polymer used for viscosity) and soda ash (to increase the pH of the viscous, muddy solution).

Photo 3: Sludge extracted in the SRU and collected into large plastic bag is temporarily stored in a trailer lined with plastic and stockpiled adjacent to the trailer. As the drill sludge is currently being stockpiled on site, Geoserve is scheduled to transport it to Johannesburg on Monday the 17th of August, 2015, where it will be tested for any contaminants by ECO Nutria.

Photo 4a: Plastic lining and knitted absorbent socks from the spill kit have been used beneath the SRU due to a small oil leak.

Photo 4b: A drip tray and knitted absorbent socks from the spill kit has been used beneath the mobile water pump to prevent any possible soil contamination.

Appendix B – Safety Data Sheet – EZEE PAC-R

AMC PAC R

AMC

Chemwatch: **4730-46**
Version No: **5.1.1.1**
Safety Data Sheet

Chemwatch Hazard Alert Code: **1**

Issue Date: **01/01/2013**
Print Date: **06/17/2015**
Initial Date: **Not Available**
L.GHS.ZAF.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	AMC PAC R
Other means of identification	Not Available

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

Relevant identified uses	Drilling fluids compound. Viscosifier/fluid loss reducer.

Details of the manufacturer/importer

Registered company name	AMC
Address	31 Basalt Street Alrode Ext. 7 Alberton South Africa
Telephone	+27 (11) 908 5595, +27 82 319 4226
Fax	+27 (11) 908 5887
Website	www.amcmud.com
Email	amc@imdexlimited.com

Emergency telephone number

Association / Organisation	**Chemwatch**
Emergency telephone numbers	**+271 1083 5222**
Other emergency telephone numbers	Not Available

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability	**1**		
Toxicity	**0**		
Body Contact	**0**		
Reactivity	**1**		
Chronic	**0**		

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

GHS Classification	Not Applicable

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	NOT APPLICABLE

Hazard statement(s)

Not Applicable

Precautionary statement(s) Prevention

Precautionary statement(s) Response

Precautionary statement(s) Storage

Precautionary statement(s) Disposal

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name	GHS Classification
9004-32-4	>99	sodium carboxymethylcellulose	Not Applicable
		(polyanionic cellulose)	

(polyanionic cellulose)

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	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 Contact	If skin or hair contact occurs: ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ 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.
Ingestion	▸ 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.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ Water spray or fog.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may

	▸ result

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard.
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.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. |Slippery when wet.
Major Spills	▸ Clear area of personnel and move upwind. |Slippery when wet.

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact.
Other information	▸ Store in original containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Lined metal can, lined metal pail/ can.
Storage incompatibility	Avoid contamination of water, foodstuffs, feed or seed.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
sodium carboxymethylcellulose	Sodium carboxymethyl cellulose; (Dowex 11)	7.1 mg/m3	78 mg/m3	5300 mg/m3

Ingredient	Original IDLH	Revised IDLH
sodium carboxymethylcellulose	Not Available	Not Available

MATERIAL DATA

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.
Personal protection	
Eye and face protection	▸ Safety glasses with side shields ▸ Chemical goggles.

Skin protection	See Hand protection below
Hands/feet protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer.
Body protection	See Other protection below
Other protection	No special equipment needed when handling small quantities.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
AMC PAC R Not Available

Material	CPI

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Lightly coloured odourless powder; soluble in water.

Physical state	Divided Solid	**Relative density (Water = 1)**	1.5-1.6
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	Not Applicable	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Applicable	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Available	**Surface Tension (dyn/cm or mN/m)**	Not Applicable
Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Applicable	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution (1%)**	Not Available
Vapour density (Air = 1)	Not Applicable	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7

Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models).
Ingestion	May produce laxative effects.
Skin Contact	The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models).
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).
Chronic	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.

AMC PAC R	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
sodium carboxymethylcellulose	**TOXICITY**	**IRRITATION**
	Dermal (rabbit) LD50: >2000 mg/kg[2]	Nil reported
	Inhalation (rat) LC50: >5.8 mg/L/4H[2]	
	Oral (rat) LD50: 27000 mg/kgd[2]	
Legend:	*1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's msds. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*	

SODIUM CARBOXYMETHYLCELLULOSE	Neoplastic by RTECS criteria

Acute Toxicity	⊘	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	⊘	**Reproductivity**	⊘
Serious Eye Damage/Irritation	⊘	**STOT - Single Exposure**	⊘
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Legend: ✔ *– Data required to make classification available*
✘ *– Data available but does not fill the criteria for classification*
⊘ *– Data Not Available to make classification*

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

NOT AVAILABLE

Ingredient	Endpoint	Test Duration	Effect	Value	Species	BCF
sodium carboxymethylcellulose	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

DO NOT discharge into sewer or waterways.

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

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
	No Data available for all ingredients	No Data available for all ingredients

Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

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

sodium carboxymethylcellulose(9004-32-4) is found on the following regulatory lists	"South Africa Hazardous Chemical Substances - Recommended Limits"

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	N (sodium carboxymethylcellulose)
Japan - ENCS	Y
Korea - KECI	Y
New Zealand - NZIoC	Y
Philippines - PICCS	Y
USA - TSCA	Y
Legend:	*Y = All ingredients are on the inventory N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 OTHER INFORMATION

Other information

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

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment.

Appendix C – Safety Data Sheet – Soda Ash

AMC SODA ASH

AMC

Chemwatch Hazard Alert Code: 2

Chemwatch: **10252**
Version No: **10.1.1.1**
Safety Data Sheet

Issue Date: **01/01/2013**
Print Date: **02/13/2015**
S.GHS.ZAF.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	AMC SODA ASH
Chemical Name	sodium carbonate
Proper shipping name	Not Applicable
Chemical formula	CH2O3.Na|C-H2-O3 .x Na
Other means of identification	Not Available
CAS number	497-19-8

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

Relevant identified uses	Manufacture of sodium salts, glass, builder in soaps, detergents, cleaners. A naturally occurring form of sodium carbonate decahydrate with 17% sodium bicarbonate, called Natron (CAS RN: 7542-12-3), is commercially available and. The mineral was used in Egyptian mummification because it absorbs water and behaves as a drying agent. Natron is an ingredient for making a distinct color called Egyptian blue.

Details of the manufacturer/importer

Registered company name	AMC		
Address	31 Basalt Street Alrode Ext. 7 Alberton South Africa		
Telephone	+27 (11) 908 5595		
Fax	+27 (11) 908 5887		
Website	www.amcmud.com		
Email	amc@imdexlimited.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	**+27 82 319 4226, +61 (0) 432 187 374**		
Other emergency telephone numbers	-		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	1	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

GHS Classification[1]	Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, STOT - SE (Resp. Irr.) Category 3
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**WARNING**

Hazard statement(s)

H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statement(s) Prevention

P271	Use only outdoors or in a well-ventilated area.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Precautionary statement(s) Storage

P405	Store locked up.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

CAS No	%[weight]	Name	GHS Classification
497-19-8	>99	sodium carbonate	Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, STOT - SE (Resp. Irr.) Category 3; H332, H315, H319, H335[1]

Legend: *1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Mixtures

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	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 Contact	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.
Inhalation	▸ If fumes or combustion products are inhaled remove from contaminated area. ▸ Lay patient down. Keep warm and rested. ▸ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ▸ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ▸ Transport to hospital, or doctor, without delay.
Ingestion	▸ Immediately give a glass of water. ▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Indication of any immediate medical attention and special treatment needed

For acute or short-term repeated exposures to highly alkaline materials:
- Respiratory stress is uncommon but present occasionally because of soft tissue edema.
- Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
- Oxygen is given as indicated.
- The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
- Damage due to alkaline corrosives occurs by liquefaction necrosis whereby the saponification of fats and solubilisation of proteins allow deep penetration into the tissue.

Alkalis continue to cause damage after exposure.
INGESTION:
- Milk and water are the preferred diluents

No more than 2 glasses of water should be given to an adult.
- Neutralising agents should never be given since exothermic heat reaction may compound injury.

* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.

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

SKIN AND EYE:
- Injury should be irrigated for 20-30 minutes.

Eye injuries require saline. [Ellenhorn & Barceloux: Medical Toxicology]

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used.

Special hazards arising from the substrate or mixture

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

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard.
Fire/Explosion Hazard	Decomposes on heating and produces acrid and toxic fumes of: , carbon monoxide (CO) , carbon dioxide (CO2) May emit poisonous fumes. |Used as a component of dry powder chemical fire extinguishers

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Remove all ignition sources.
Major Spills	Moderate hazard.

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Avoid all personal contact, including inhalation.
Other information	▸ Store in original containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ **DO NOT** use aluminium or galvanised containers ▸ Polyethylene or polypropylene container.
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.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
sodium carbonate		12 mg/m3	130 mg/m3	780 mg/m3

Ingredient	Original IDLH	Revised IDLH
sodium carbonate	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.
Personal protection	
Eye and face protection	▸ Safety glasses with side shields.
Skin protection	See Hand protection below
Hands/feet protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer.
Body protection	See Other protection below
Other protection	▸ Overalls.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Not Available AMC SODA ASH

Material	CPI

Respiratory protection

Particulate.

Required Minimum	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator

NATURAL RUBBER	A
NITRILE	A

Not Available

Protection Factor			
up to 10 x ES	P1 Air-line*	- -	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

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

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic 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).

Physical state	Divided Solid	**Relative density (Water = 1)**	2.53 @ 20 C
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Applicable	**Decomposition temperature**	>400
Melting point / freezing point (°C)	851	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	Not Applicable	**Molecular weight (g/mol)**	106
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Applicable	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Applicable
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	Not Applicable
Vapour pressure (kPa)	Not Applicable	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	11.3
Vapour density (Air = 1)	Not Applicable		

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	‣ Unstable in the presence of incompatible materials.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Inhalation of dusts, generated by the material, during the course of normal handling, may be harmful.

Ingestion	The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). |The fatal dose for a adult human is reported to be approximately 30 grams.
Skin Contact	The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time.
Eye	510sodacarb Alkaline salts may be intensely irritating to the eyes and precautions should be taken to ensure direct eye contact is avoided.
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

AMC SODA ASH	**TOXICITY**	**IRRITATION**
	Oral (rat) LD50: 2800 mg/kg*d|dermal (rat) LD50: >2000 mg/kg*E|Inhalation (rat) LC50: 2.3 mg/L/2he|Inhalation (mouse) LC50: 1.2 mg/L/2h|Inhalation (guinea pig) LC50: 0.8 mg/L/2h	Skin (rabbit): 500 mg/24h mild|Eye (rabbit): 100 mg/24h moderate|Eye (rabbit): 100 mg/30s mild|Eye (rabbit): 50 mg SEVERE
AMC SODA ASH	**TOXICITY**	**IRRITATION**
	Oral (rat) LD50: 2800 mg/kg*d|dermal (rat) LD50: >2000 mg/kg*E|Inhalation (rat) LC50: 2.3 mg/L/2he|Inhalation (mouse) LC50: 1.2 mg/L/2h|Inhalation (guinea pig) LC50: 0.8 mg/L/2h	Skin (rabbit): 500 mg/24h mild|Eye (rabbit): 100 mg/24h moderate|Eye (rabbit): 100 mg/30s mild|Eye (rabbit): 50 mg SEVERE

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

SODIUM CARBONATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases.

Acute Toxicity		**Carcinogenicity**	
Skin Irritation/Corrosion		**Reproductivity**	
Serious Eye Damage/Irritation		**STOT - Single Exposure**	
Respiratory or Skin sensitisation		**STOT - Repeated Exposure**	
Mutagenicity		**Aspiration Hazard**	

CMR STATUS

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

For sodium carbonate
Environmental Fate:
As sodium carbonate has the capacity to drastically increase the pH of an ecosystm, the extent of its effect on organisms depends on the buffer capacity of the aquatic or terrestrial ecosystem, and the pH tolerance levels of the organisms living there.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	LOW (LogKOW = -0.4605)

Mobility in soil

Ingredient	Mobility
Not Available	HIGH (KOC = 1)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	Legislation addressing waste disposal requirements may differ by country, state and/ or territory.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant: NO	

Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Inland waterways transport (ADNR / River Rhine): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

UN number	Not Available
Packing group	Not Available
UN proper shipping name	Not Available
Environmental hazard	No relevant data
Transport hazard class(es)	Not Available | Not Applicable
Special precautions for user	Classification code: Not Available Limited quantity: Not Available Equipment required: Not Available Fire cones number: Not Available

Transport in bulk according to Annex II of MARPOL 73 / 78 and the IBC code

Source	Ingredient	Pollution Category	Residual Concentration - Outside Special Area (% w/w)	Residual Concentration
IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk	sodium carbonate	Z	Not Available	Not Available

SECTION 15 REGULATORY INFORMATION

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

sodium carbonate(497-19-8) is found on the following regulatory lists	"Not Applicable"

SECTION 16 OTHER INFORMATION

Other information

Ingredients with multiple cas numbers

Name	CAS No
Not Available	Not Available

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.

Appendix D – Safety Data Sheet – EZEE PAC-L

AMC EZEE-PAC L

AMC

Chemwatch Hazard Alert Code: 1

Chemwatch: **24-4294**
Version No: **3.1.1.1**
Safety Data Sheet

Issue Date: **08/06/2013**
Print Date: **02/12/2015**
S.GHS.ZAF.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	AMC EZEE-PAC L
Chemical Name	Not Applicable
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

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

Relevant identified uses	Drilling fluids compound, filtrate reducer.

Details of the manufacturer/importer

Registered company name	AMC		
Address	31 Basalt Street Alrode Ext. 7 Alberton South Africa		
Telephone	+27 (11) 908 5595		
Fax	+27 (11) 908 5887		
Website	www.amcmud.com		
Email	amc@imdexlimited.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	**+27 82 319 4226, +61 (0) 432 187 374**		
Other emergency telephone numbers	-		

CHEMWATCH EMERGENCY RESPONSE

Primary Number	Alternative Number 1	Alternative Number 2
+271 1083 5222	+612 9186 1132	Not Available

Once connected and if the message is not in your prefered language then please dial 01

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	1	
Toxicity	0	
Body Contact	0	
Reactivity	1	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

GHS Classification	Not Applicable

Label elements

GHS label elements	Not Applicable
SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Not Applicable

Precautionary statement(s) Prevention

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

Mixtures

CAS No	%[weight]	Name	GHS Classification
9004-32-4	>90	sodium carboxymethylcellulose	Not Applicable
(polyanionic cellulose)			

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	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 Contact	If skin or hair contact occurs: ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ 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.
Ingestion	▸ 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.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ Water spray or fog. ▸ Foam.

Special hazards arising from the substrate or mixture

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

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves.
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.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid contact with skin and eyes. |Slippery when wet.
Major Spills	▸ Clear area of personnel and move upwind. ▸ Alert Fire Brigade and tell them location and nature of hazard. |Slippery when wet.

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Packaging as recommended by manufacturer. |15kg boxes or pails
Storage incompatibility	Avoid contamination of water, foodstuffs, feed or seed. Cellulose and its derivatives may react vigorously with calcium oxide, bleaching powder, perchlorates, perchloric acid, sodium chlorate, fluorine, nitric acid, sodium nitrate and sodium nitrite.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
sodium carboxymethylcellulose		7.1 mg/m3	78 mg/m3	5300 mg/m3

Ingredient	Original IDLH	Revised IDLH
sodium carboxymethylcellulose	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
Personal protection	
Eye and face protection	▸ Safety glasses with side shields ▸ Chemical goggles. ▸ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants.
Skin protection	See Hand protection below
Hands/feet protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
Body protection	See Other protection below
Other protection	No special equipment needed when handling small quantities. **OTHERWISE:** ▸ Overalls.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Not Available AMC EZEE-PAC L Not Available

Material	CPI

Not Available

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:000 & 149:001, ANSI Z88 or national equivalent)

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	P1 Air-line*	- -	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

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

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Lightly coloured odourless powder; soluble in water.

Physical state	Divided Solid	**Relative density (Water = 1)**	1.5-1.6

Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	Not Applicable	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Applicable	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Available	**Surface Tension (dyn/cm or mN/m)**	Not Applicable
Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Applicable	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	8.0-10.0
Vapour density (Air = 1)	Not Applicable		

SECTION 10 STABILITY AND REACTIVITY

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

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	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.
Ingestion	Bulk laxatives can cause temporary bloating and blockage of the oesophagus and/or intestine. As they shorten the time of digestion, the absorption of other drugs will be affected.
Skin Contact	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.
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.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course. This material contains a substantial amount of polymer considered to be of low concern.

AMC EZEE-PAC L	**TOXICITY**	**IRRITATION**
AMC EZEE-PAC L	**TOXICITY**	**IRRITATION**

Not available. Refer to individual constituents.

SODIUM CARBOXYMETHYLCELLULOSE	Neoplastic by RTECS criteria

Acute Toxicity		**Carcinogenicity**	
Skin Irritation/Corrosion		**Reproductivity**	
Serious Eye Damage/Irritation		**STOT - Single Exposure**	
Respiratory or Skin sensitisation		**STOT - Repeated Exposure**	
Mutagenicity		**Aspiration Hazard**	

CMR STATUS

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.
|Polyanionic cellulose, inherently biodegradable.
May be harmful to fauna if not disposed of according to Section 13 and legislative requirements. [AMC]

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	No Data available for all ingredients	No Data available for all ingredients

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	No Data available for all ingredients

Mobility in soil

Ingredient	Mobility
Not Available	No Data available for all ingredients

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ 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.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant: NO	

Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Inland waterways transport (ADNR / River Rhine): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

UN number	Not Available
Packing group	Not Available
UN proper shipping name	Not Available
Environmental hazard	No relevant data
Transport hazard class(es)	Not Available ⋮ Not Applicable

Special precautions for user	Classification code	Not Available
	Limited quantity	Not Available
	Equipment required	Not Available
	Fire cones number	Not Available

SECTION 15 REGULATORY INFORMATION

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

sodium carboxymethylcellulose(9004-32-4) is found on the following regulatory lists	"South Africa Hazardous Chemical Substances - Recommended Limits"

SECTION 16 OTHER INFORMATION

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

Appendix E – Safety Data Sheet – Bordet

AMC BORDET

AMC

Chemwatch Hazard Alert Code: 3

Chemwatch: **25-9162**
Version No: **3.1.1.1**
Safety Data Sheet

Issue Date: **10/28/2013**
Print Date: **02/13/2015**
S.GHS.ZAF.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	AMC BORDET
Chemical Name	Not Applicable
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

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

Relevant identified uses	Use according to manufacturer's directions. Drilling fluid additives.

Details of the manufacturer/importer

Registered company name	AMC		
Address	31 Basalt Street Alrode Ext. 7 Alberton South Africa		
Telephone	+27 (11) 908 5595		
Fax	+27 (11) 908 5887		
Website	www.amcmud.com		
Email	amc@imdexlimited.com		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	**+27 82 319 4226, +61 (0) 432 187 374**		
Other emergency telephone numbers	-		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	3	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

GHS Classification[1]	Acute Toxicity (Oral) Category 4, Serious Eye Damage Category 1
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	
SIGNAL WORD	**DANGER**

Hazard statement(s)

H302	Harmful if swallowed
H318	Causes serious eye damage

Precautionary statement(s) Prevention

P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

Mixtures

CAS No	%[weight]	Name	GHS Classification
Not Available	10-30	fatty alcohol ethoxylate	Not Applicable
60-00-4	NotSpec.	EDTA	Acute Toxicity (Oral) Category 4, Eye Irritation Category 2A, Chronic Aquatic Hazard Category 3; H302, H319, H412[1]
7732-18-5	NotSpec.	water	Not Applicable

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Immediately hold eyelids apart and flush the eye continuously with running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15

	▸ minutes. ▸ Transport to hospital or doctor without delay. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin 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.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ **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. ▸ If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist. ▸ If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS. **Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:** ▸ **INDUCE** vomiting with fingers down the back of the throat, **ONLY IF CONSCIOUS**. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. **NOTE:** Wear a protective glove when inducing vomiting by mechanical means.

Indication of any immediate medical attention and special treatment needed

	As in all cases of suspected poisoning, follow the ABCDEs of emergency medicine (airway, breathing, circulation, disability, exposure), then the ABCDEs of toxicology (antidotes, basics, change absorption, change distribution, change elimination). For poisons (where specific treatment regime is absent): ---------- BASIC TREATMENT ---------- ▸ Establish a patent airway with suction where necessary. ▸ Watch for signs of respiratory insufficiency and assist ventilation as necessary. ▸ Administer oxygen by non-rebreather mask at 10 to 15 L/min. ▸ Monitor and treat, where necessary, for pulmonary oedema. ▸ Monitor and treat, where necessary, for shock. ▸ Anticipate seizures. ▸ **DO NOT** use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool. ---------- ADVANCED TREATMENT ---------- ▸ Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred. ▸ Positive-pressure ventilation using a bag-valve mask might be of use. ▸ Monitor and treat, where necessary, for arrhythmias. ▸ Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications. ▸ Drug therapy should be considered for pulmonary oedema. ▸ Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications. ▸ Treat seizures with diazepam. ▸ Proparacaine hydrochloride should be used to assist eye irrigation. *BRONSTEIN, A.C. and CURRANCE, P.L.* *EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994* Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ There is no restriction on the type of extinguisher which may be used.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	‣ Alert Fire Brigade and tell them location and nature of hazard.
Fire/Explosion Hazard	‣ Non combustible.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	‣ Clean up all spills immediately.
Major Spills	Moderate hazard.
	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	‣ Avoid all personal contact, including inhalation.
Other information	‣ Store in original containers.

Conditions for safe storage, including any incompatibilities

Suitable container	‣ Polyethylene or polypropylene container.
Storage incompatibility	‣ Avoid reaction with oxidising agents

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Not Available

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
EDTA		7.1 mg/m3	78 mg/m3	160 mg/m3

Ingredient	Original IDLH	Revised IDLH
fatty alcohol ethoxylate	Not Available	Not Available
EDTA	Not Available	Not Available
water	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.
Personal protection	
Eye and face protection	‣ Safety glasses with side shields.
Skin protection	See Hand protection below
Hands/feet protection	‣ Wear chemical protective gloves, e.g. PVC.
Body protection	See Other protection below

Other protection	‣ Overalls.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Not Available AMC BORDET

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A
NATURAL RUBBER	C
PVA	C

Not Available

Respiratory protection

Not Applicable

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Almost colourless to pale yellow liquid; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	11-13	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	<-10 (freezing)	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available		

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	‣ Unstable in the presence of incompatible materials.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	There is some evidence to suggest that the material can cause respiratory irritation in some persons.

Ingestion	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.
Skin Contact	There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.
Eye	If applied to the eyes, this material causes severe eye damage.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

AMC BORDET	**TOXICITY**	**IRRITATION**
	Oral (Rat) LD50: <2000 mg/kg>	
	Oral (Rat) LD50: <2000 mg/kg>	
	Oral (Rat) LD50: <2000 mg/kg>	

AMC BORDET	**TOXICITY**	**IRRITATION**
	Oral (Rat) LD50: <2000 mg/kg>	
	Oral (Rat) LD50: <2000 mg/kg>	
	Oral (Rat) LD50: <2000 mg/kg>	

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

EDTA	For ethylenediaminetetraacetic acid (EDTA) and its salts: EDTA is a strong organic acid (approximately 1000 times stronger than acetic acid).
AMC BORDET, WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity		**Carcinogenicity**	
Skin Irritation/Corrosion		**Reproductivity**	
Serious Eye Damage/Irritation		**STOT - Single Exposure**	
Respiratory or Skin sensitisation		**STOT - Repeated Exposure**	
Mutagenicity		**Aspiration Hazard**	

CMR STATUS

REPROTOXIN	EDTA	ILO Chemicals in the electronics industry that have toxic effects on reproduction

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

DO NOT discharge into sewer or waterways.
|WGK: 2 (only Fatty alcohol ethoxylate)|For the alcohol ethoxylate: Dissolved Organic Carbon Removal (DOC removal) (Modified|OECD Guideline 301E) 94%|Ecotoxicity: By comparison with analogous products, a value in the following range is anticipated.|LC50 (96 hour) (semi-static) rainbow trout 10 - 100mg/l|EC50 (48 hour) Daphnia magna 5 - 25mg/l|Effect on Effluent Treatment: The product is anticipated to be substantially removed in biological treatment processes.
May be harmful to fauna if not disposed of according to Section 13 and legislative requirements. [AMC]

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	LOW	LOW
Not Available	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	LOW (BCF = 123)

Not Available	LOW (LogKOW = -1.38)

Mobility in soil

Ingredient	Mobility
Not Available	LOW (KOC = 1046)
Not Available	LOW (KOC = 14.3)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Containers may still present a chemical hazard/ danger when empty.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant: NO	

Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Inland waterways transport (ADNR / River Rhine): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

UN number	Not Available
Packing group	Not Available
UN proper shipping name	Not Available
Environmental hazard	No relevant data
Transport hazard class(es)	Not Available | Not Applicable
Special precautions for user	Classification code: Not Available Limited quantity: Not Available Equipment required: Not Available Fire cones number: Not Available

SECTION 15 REGULATORY INFORMATION

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

EDTA(60-00-4) is found on the following regulatory lists	"Not Applicable"
water(7732-18-5) is found on the following regulatory lists	"Not Applicable"

SECTION 16 OTHER INFORMATION

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