File No: STD/1538

March 2015

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Amines, C36-alkylenedi-

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment.

For the purposes of subsection 78(1) of the Act, this Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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Director
NICNAS

TABLE OF CONTENTS

SUMMARY

The following details will be published in the NICNAS *Chemical Gazette:*

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS CHEMICAL	INTRODUCTION VOLUME	USE
STD/1538	Halliburton Australia Pty Ltd	Amines, C36-alkylenedi-	ND*	≤ 100 tonne/s per annum	Additive in drilling fluids

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
As no toxicity data were provided, the notified chemical cannot be classified according to the *Globally Harmonised System for the Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

Human health risk assessment
Provided that the recommended controls are being adhered to, under the conditions of the occupational settings described, the notified chemical is not considered to pose an unreasonable risk to the health of workers.

When used in the proposed manner, the notified chemical is not considered to pose an unreasonable risk to public health.

Environmental risk assessment
Based on the low hazard and reported use pattern, the notified chemical is not considered to pose an unreasonable risk to the environment.

Recommendations

CONTROL MEASURES

Occupational Health and Safety

- A person conducting a business or undertaking at a workplace should implement the following engineering controls to minimise occupational exposure to the notified chemical:
  - Good general ventilation

- A person conducting a business or undertaking at a workplace should implement the following safe work practices to minimise occupational exposure during handling of the notified chemical:
  - Avoid contact with skin and eyes

- A person conducting a business or undertaking at a workplace should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical:
  - Coveralls, impervious gloves, goggles

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the (M)SDS should be easily accessible to employees.

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS)* as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Disposal

- Where reuse or recycling are not appropriate, dispose of the notified chemical in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Emergency procedures

- Spills or accidental release of the notified chemical should be handled by physical containment, collection and subsequent disposal.

Regulatory Obligations

Secondary Notification
This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
  - information becomes available on the human health effects of the notified chemical.

or

(2) Under Section 64(2) of the Act; if
  - the function or use of the chemical has changed from additive in drilling fluids, or is likely to change significantly;
  - the amount of chemical being introduced has increased, or is likely to increase, significantly;
  - the chemical has begun to be manufactured in Australia;
  - additional information has become available to the person as to an adverse effect of the chemical on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

(Material) Safety Data Sheet
The (M)SDS of the notified chemical provided by the notifier was reviewed by NICNAS. The accuracy of the information on the (M)SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Halliburton Australia Pty Ltd (ABN: 73 009 000 775)
Level 17, 444 Queen Street
Brisbane QLD 4000

NOTIFICATION CATEGORY
Standard: Chemical other than polymer (more than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: use details and import volume.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows: all physico-chemical and toxicological endpoints.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
Commercial Evaluation Permit (2014) and Commercial Evaluation Renewal Permit (2014)

NOTIFICATION IN OTHER COUNTRIES
Canada, China, Europe, Korea, New Zealand and USA

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
BDF-570

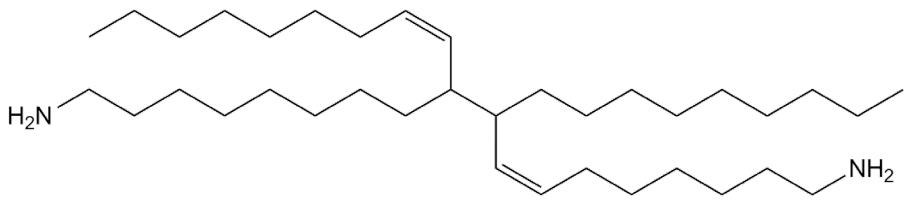
CAS NUMBER
68955-56-6

CHEMICAL NAME
Amines, C36-alkylenedi-

OTHER NAMES
C36-dimer fatty acid, diamine hydrogenate
Dimer diamine

MOLECULAR FORMULA
Unspecified

STRUCTURAL FORMULA



Representative structure of molecule with C36 fatty acid dimer diamine

MOLECULAR WEIGHT
500 – 600 Da

ANALYTICAL DATA
No spectra were provided.

3. COMPOSITION

DEGREE OF PURITY
99%

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
None

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (> 1% BY WEIGHT)
None

ADDITIVES/ADJUVANTS
None

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Amber coloured liquid

Property	Value	Data Source/Justification
Melting Point/Freezing Point	< -30 °C	(M)SDS
Boiling Point	> 350 °C	(M)SDS
Density	900 kg/m^3 at 20 °C	(M)SDS
Vapour Pressure	< 2 × 10^{-8} kPa	(M)SDS
Water Solubility	2 × 10^{-6} g/L at 20°C	(M)SDS. The notified chemical is expected to be water dispersible based on its amphiphilic structure and use as an emulsifier.
Hydrolysis as a Function of pH	Not determined	Does not contain hydrolysable functionalities
Partition Coefficient (n-octanol/water)	Not determined	The notified chemical is an emulsifier and will tend to accumulate at the phase interface of octanol and water and/or form emulsions.
Adsorption/Desorption	Not determined	The notified chemical is expected to associate with soil, sediment and sludge based on the presence of cationic functionalities
Dissociation Constant	Not determined	Contains ionisable functionalities. Therefore, the notified chemical is expected to be ionised at the environmental pH range of 4 – 9.
Flash Point	> 200 °C at 101.3 kPa	(M)SDS
Autoignition Temperature	Not determined	Not expected to autoignite under normal condition of use
Explosive Properties	Not determined	Contains no functional groups that would imply explosive properties
Oxidising Properties	Not determined	Contains no functional groups that would imply explosive properties

DISCUSSION OF PROPERTIES

Reactivity
The notified chemical is expected to be stable under normal conditions of use.

Physical hazard classification
Based on the submitted physico-chemical data depicted in the above table, the notified chemical is not recommended for hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified chemical will not be manufactured in Australia. The notified chemical will be imported into Australia at a concentration of 60-100%.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	≤ 100	≤ 100	≤ 100	≤ 100	≤ 100

PORT OF ENTRY
Fremantle, Melbourne, Brisbane and Adelaide

TRANSPORTATION AND PACKAGING
The notified chemical will be imported into Australia in 187 kg drums on shrink-wrapped pallets. The notified chemical will be transported by road to the on-shore drilling sites or by road and sea to off-shore drilling sites.

USE
The notified chemical will be used as a viscosifier to modify rheological properties in oil and synthetic-based drilling fluid systems for both on-shore and off-shore use. It will be used to form a stable emulsion during drilling applications and to control the stability of the drilling fluid system. The final concentration of the notified chemical will be < 10 kg per cubic meter of drilling fluid. The notified chemical will be used in both on-shore and off-shore drilling sites.

OPERATION DESCRIPTION
The notified chemical will be imported into Australia and transported to the site of use by road and sea. At the site of use, the notified chemical will be mixed with other ingredients in a vented mixing vessel to formulate a drilling fluid system with desired rheological properties. This drilling fluid will be used in bore drilling and once the drilling operations are complete, the majority of the drilling fluid containing the notified chemical will be brought back to the surface and reused. The notifier anticipates that about 75% of the drilling fluid will be reused. Approximately 20% of the drilling fluid will remain inside the well behind the casing strings and the remaining 5% will be discarded during the reconditioning of the fluid.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Engineer	< 1	70
Drill rig contractor	< 1	70

EXPOSURE DETAILS
Transport and storage workers are not expected to be exposed to the notified chemical (60-100% concentration) except in the unlikely event of accidental release due to container breach or spill. Potential routes of exposure are dermal and ocular.

Drill rig contractors and engineers may be exposed to the notified chemical at 60-100% concentration via the dermal and ocular and perhaps inhalation routes during addition and mixing of the notified chemical to produce a drill fluid, transfer of drill fluid to the site of use, and equipment cleaning and maintenance. Exposure is expected to be minimized by using personal protective equipment (PPE) such as impervious gloves, coveralls, boots and safety glasses or face shields as anticipated by the notifier in the application dossier.

6.1.2. Public Exposure
The notified chemical is intended for use in industry only. Public exposure to the notified chemical is not expected except in the unlikely event of an accident occurring during road transport. Exposure to the public is therefore expected to be negligible.

6.2. Human Health Effects Assessment

No toxicity data were submitted for the notified chemical. The notified chemical is a diamine, which is formed by dimerization of two fatty acids followed by conversion of carboxylic acids to primary amines. As such the

notified chemical can be classified as primary fatty amine. Primary fatty amines of similar chain length and degree of saturation can be considered as close analogues of the notified chemical for read-across. Published reports on screening-level hazard characterization of fatty nitrogen derived amines category (US EPA 2010) and an analogue chemical, amines, coco alkyl (CAS No. 61788-46-3; ECHA 2011), were provided by the notifier to fill the data gaps for human toxicological endpoints.

Toxicokinetics, metabolism and distribution.
No toxicokinetics, metabolism or distribution studies were provided on the notified chemical. For dermal absorption, molecular weights below 100 Da. are favourable for absorption and molecular weights above 500 Da. do not favour absorption in addition absorption is likely to be low if the water solubility is below 1 mg/L (ECHA, 2014). The notified chemical has a moderately high molecular weight (500 – 600 Da.) and low water solubility (2×10^{-6} g/L at 20°C) and therefore is expected to have low absorption across biological membranes. However, acute oral and repeated dose toxicity via oral gavage on analogue chemicals suggest that there is a potential for the notified chemical to cross the gastrointestinal tract.

Acute toxicity.
No acute toxicity data were provided for the notified chemical. The analogue chemical amines, coco alkyl has a reported LD_{50} of 1,300 mg/kg bw when administered via oral gavage (ECHA, 2011). The fatty nitrogen derived amines listed in the US EPA (2010) report had LD_{50} values between 620 mg/kg and > 15,000 mg/kg for acute oral toxicity. In acute dermal toxicity studies the LD_{50} values were between ~ 1,600 mg/kg and 8,000 mg/kg with only one of the eight chemicals on which there was data having an LD_{50} < 2,000 mg/kg (US EPA, 2010). Acute inhalation toxicity studies resulted in no mortalities in the two chemical mentioned in the US EPA (2010) report.

Based on the analogue data the notified chemical is expected to be of low toxicity via the dermal or inhalation routes but may be harmful via the oral route.

Irritation and sensitisation.
No irritation data were provided for the notified chemical. According to the ECHA (2011) and US EPA (2010) reports, long chain alkyl amines are moderately irritating to skin and severely irritating or damaging to eyes. Based on the structural similarities, the notified chemical is expected to be irritating to skin and eyes.

No information on the skin sensitization potential of the notified chemical or suitable analogues was provided. The diamine functional group presents a concern for sensitisation, however, the aliphatic chain length in the notified chemical exceeds the range of greatest concern although the possibility of the notified chemical being a skin sensitizer cannot be ruled out (Barratt et al., 1994; Gerner et al., 2004).

Repeated dose toxicity.
No information on the repeated dose toxicity of the notified chemical was provided. Repeated dose toxicity studies by both dermal and oral routes conducted on various chemicals from the primary fatty amines class show evidence of adverse systemic effects at levels requiring classification (US EPA, 2010). Based on this, the notified chemical may cause adverse effects following repeated dermal or oral exposure.

Mutagenicity/Genotoxicity.
No information on the mutagenicity or genotoxicity of the notified chemical were provided. In vitro and in vivo studies conducted on fatty nitrogen derived amines minimal mutagenicity or genotoxicity was observed (US EPA, 2010). Therefore, the notified chemical is expected to be non-genotoxic and non-mutagenic.

Health hazard classification
As no toxicity data were provided, the notified chemical cannot be classified according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety
Based on the studies conducted on primary fatty amines with structures similar to the notified chemical it is expected that the notified chemical may be irritating to the skin and eyes, cause adverse effects following repeated exposure, and the potential for skin sensitisation cannot be ruled out. There is a potential for dermal, ocular and perhaps inhalation exposure of workers to the notified chemical at 60-100% concentration, during

addition of the notified chemical to the drilling fluid, blending and equipment cleaning and maintenance. The notifier anticipates that the use of PPE such safety helmets, goggles, coveralls, impervious gloves and boots along with good general ventilation will minimize the exposure.

Overall, provided that control measures are in place to minimize worker exposure to the notified chemical, including the use of PPE and well ventilated environments, the risk to the health of workers from use of the notified chemical is not considered to be unreasonable.

6.3.2. Public Health

The public is not expected to be exposed to the notified chemical except in an event of an accident during road transport; hence the risk to the public is not considered unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified chemical will not be manufactured or reformulated in Australia. Therefore, release of the notified chemical from these activities is not expected.

The notified chemical will be imported by the notifier as a finished end-use product. Release of the notified chemical to the environment during import, storage, and transport is also unlikely. Release from residues in storage and shipping containers is expected to be minimal. Empty containers are expected to be disposed of in accordance with local requirements. Spills or accidental release of the notified chemical are expected to be contained and disposed of in accordance with local regulations.

RELEASE OF CHEMICAL FROM USE

For a typical application in a well, approximately 1,000 – 10,000 kg of the notified chemical are expected to be used per treatment. The product, containing 60-100% of the notified chemical, is added to the active mud system or in conjunction with other ingredients (e.g. emulsion products and water) in a vented mixing vessel at the surface. The resultant mixture containing the notified chemical is incorporated into the oil- or synthetic-based fluid system.

When drilling operations are complete, approximately 75% of the notified chemical in drilling fluid (drilling mud) is expected to be brought back from the well and re-used and a further 5% will be disposed of in accordance with local regulations. The remaining 20% of the notified chemical contained within the drilling fluid is expected to be left inside the well and may eventually be discharged to the environment.

RELEASE OF CHEMICAL FROM DISPOSAL

Disposal of oil and synthetic drilling fluid is rare due to the high value of the fluid and the significant disposal costs. All reasonable means may be taken to economically retain and reuse the fluids.

If the mud cannot be re-used, it will be sent to a registered disposal facility. The solids containing most of the notified chemical are expected to be sent to landfill or a tailings dam for disposal. Furthermore, solids which have been generated through mechanical separation to recondition the fluid are also expected to be sent to landfill.

7.1.2. Environmental Fate

The notified chemical is not expected to biodegrade rapidly based on the provided study. Details of the biodegradation study can be found in Appendix A. The notified chemical is biodegradable (32% to 66.5% biodegradable at 28 days). However, the notified chemical is not considered readily biodegradable according to the OECD guidelines. The notified chemical is not persistent in the environment. While the low molecular weight may suggest potential for bioaccumulation, the presence of potentially cationic ions is expected to significantly reduce the bioaccumulation potential. Given the presence of potentially cationic functional groups, the notified chemical is expected to bind strongly to soil and/or sediment soon after entering the water/sediment system.

In most circumstances, the notified chemical will be incorporated into the bulk drilling fluid and share the fate of the drilling mud. The mud systems will be pumped from wells for disposal, recycling or reuse after the completion of drilling operations. Oil-based drilling mud is expected to be re-used and is not expected to be

directly released to the water environment. For on-shore application, the mud solids are expected to be sent to landfill or a tailings dam. In landfill or tailings dams, the notified chemical is not expected to be mobile based on its strong potential to bind to soil/sediment.

In the ocean, the notified chemical is expected to bind to sediment. In all cases, the notified chemical is expected to ultimately degrade via biotic or abiotic pathways to form water and oxides of carbon and nitrogen.

7.1.3. Predicted Environmental Concentration (PEC)

Off-shore application
The notified chemical will be used as a viscosifier in oil- or synthetic-based drilling fluid systems. The standard risk assessment procedure (modelling using CHARM by Thatcher et al., 2005) cannot be used in these cases to derive the predicted environmental concentration (PEC). This is because CHARM does not consider drilling chemicals containing organic phase fluids (oil based and synthetic based fluids).

A predicted environmental concentration (PEC) has not been calculated in this assessment. Based on the assessed used pattern, the amount of the notified chemical expected to be discharged to the sea is potentially significant. The notifier has advised that approximately 20% of the notified chemical in drilling fluid is expected to be left in the well. Under a worst case scenario, it is conservatively assumed that this might be discharged to the sea. Once the notified chemical reaches the sea, it is expected to disperse and biodegrade. Since the notified chemical has very low water solubility and potential cationicity, the remaining notified chemical is expected to bind to sediment and be removed from the seawater column. Hence, the notified chemical is not expected to reach ecotoxicologically significant concentrations in the marine environment.

Based on the actual point of discharge (the sea-floor), the potential for biodegradability and the potential low hazard of the notified chemical, the risk to the marine environment is not considered to be unreasonable.

On-shore application
Based on the information provided by the notifier, significant release of the notified chemical to the aquatic environment from on-shore use is not expected. Therefore, the calculation of a PEC for on-shore applications was not assessed to be necessary.

7.2. Environmental Effects Assessment

The results from ecotoxicological investigations conducted on the notified chemical are summarised in the table below. Details of these studies can be found in Appendix A.

Endpoint	*Result*	*Assessment Conclusion*
Marine Fish Toxicity	96 h LL50 > 10,000 mg/L (WAF)	No effect at saturation to fish
Marine Copepod Toxicity	48 h EL50 > 3000 mg/L (WAF)	No effect at saturation to aquatic invertebrates
Marine Algal Toxicity	72 h EL50 > 14.5 mg/L (WAF)	No effect at saturation to algae
Marine Sediment Re-worker Toxicity	10 d LL50 > > 12,469.5 mg/kg dried sediment	No effect at saturation to sediment re-workers

WAF: Water Accommodated Fraction

Based on the above ecotoxicity endpoints for fish, daphnia and algae, the notified chemical showed no effect at the level of saturation. Therefore, the notified chemical has not been formally classified for its acute and long-term hazard under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS, United Nations, 2009).

7.2.1. Predicted No-Effect Concentration

A predicted no effect concentration (PNEC) has not been calculated as the notified chemical is not considered to be harmful to aquatic biota up to the limit of its solubility in water.

7.3. Environmental Risk Assessment

A risk quotient RQ (PEC/PNEC) has not been derived since neither the PEC nor the PNEC is calculated. The notified chemical is expected to degrade in soil/sediment, although it is expected to be neither readily

biodegradable, nor be bioaccumulative. Based on the low hazard and the assessed use pattern of the notified chemical, it is not expected to pose an unreasonable risk to the environment.

APPENDIX A: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

A.1. Environmental Fate

A.1.1. Ready biodegradability

TEST SUBSTANCE: Notified chemical

METHOD
- Inoculum: Natural seawater
- Exposure Period: 35 days
- Auxiliary Solvent: Not applied
- Analytical Monitoring: Biological oxygen demand (BOD)
- Remarks - Method: The test was conducted according to the guideline above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported.

RESULTS

Test substance (0.3 mg/bottle)		*Test substance(0.6 mg/bottle)*		*Reference substance (Sodium benzoate)*	
Day	*% Degradation*	*Day*	*% Degradation*	*Day*	*% Degradation*
7	21.2	7	9.7	7	50.4
14	43.9	14	20.2	14	60.6
21	56.6	21	22.3	21	66.7
28	66.5	28	32.0	28	69.8
35	82.1	35	39.7	35	71.4

Remarks - Results

All validity criteria for the test were satisfied. A measureable inhibitory effect (average of 49%) by test substance on the biodegradation of the reference substance, sodium benzoate, was observed.

The reference base oil control achieved 48.7% degradation by day 28 and 49.9% by day 35.

Biodegradation of the notified chemical was 66.5% and 32.0% for the tests using 0.3 and 0.6 mg/bottle, respectively. However, it was noted in the test report that the test substance exhibited an inhibitory effect on the biodegradation of the reference substance, sodium benzoate, by an average of 49%. Therefore, the resulting lack of ready biodegradation of the notified chemical may be due to the toxic effect of the notified chemical on the naturally occurring bacteria in the seawater sample.

Due to the chemical properties of the test substance, the 10-day window is not applicable as stated in the relevant OECD Guideline for Testing Chemicals, Section 3. However, the test substance must degrade biotically by > 60% in 28 days to meet the rapid biodegradation standard according to under the Globally Harmonised System classification (GHS; United Nations, 2009). Therefore, the test substance cannot be classified as readily biodegradable according to the OECD (301 F) guideline.

CONCLUSION: The notified chemical is not readily biodegradable

TEST FACILITY: Baroid (2011a)

A.2. Ecotoxicological Investigations

A.2.1. Acute toxicity to marine fish

TEST SUBSTANCE: Notified chemical

METHOD: OSPARCOME (1995) Protocol for a Fish Acute Toxicity Test based on

	OECD TG 203 Guidelines
Species	Marine juvenile fish (*Cyprinodon variegatus*)
Exposure Period	96 hours
Auxiliary Solvent	Not applied
Salinity	31 – 33 ‰
Analytical Monitoring	Not applied
Remarks – Method	The test was conducted according to the guidelines above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported. The fish ecotoxicity test was conducted in Water Accommodated Fractions (WAFs) of the notified chemical as it is a complex mixture and has low water solubility. Water Accommodated Fractions (WAFs) containing the test substance for all treatments were prepared in synthetic seawater. The mixtures were gently stirred for approximately 20 hours, following by a settling period of at least one hour. The middle clear phase was siphoned and used as the treatment solution.

RESULTS

Nominal Concentration (WAF;mg/L)	*Number of Fish*	*Mortality (cumulative)*	
		48h	*96 h*
Control	10	0	0
1000	10	0	0
2000	10	0	0
3000	10	0	0
5000	10	0	0
10,000	10	0	0

LL50	> 10,000 mg/L at 96 hours (WAF)
NOEL	10,000 mg/L at 96 hours (WAF)
Remarks – Results	All validity criteria for the test were satisfied. The treatment solutions were renewed at 48-h. The notified chemical is considered not harmful to fish since no significant effects were observed up to the highest concentration of 10,000 mg/L (WAF). The 96-hour LL50 was calculated by the trimmed Spearman-Karber method for range finding tests. However, for the definitive test, the endpoints were determined based on visual observations.
CONCLUSION	The notified chemical was not harmful at saturation to fish
TEST FACILITY	Baroid (2010a)

A.2.2. Acute toxicity to marine copepod

TEST SUBSTANCE	Notified chemical
METHOD	ISO 14669:1999 (E) Water Quality – Determination of Acute Toxicity to Marine Copepods –Static test
Species	*Acartia tonsa*
Exposure Period	48 hours
Auxiliary Solvent	Not applied
Salinity	29.3 – 32.4 %
Analytical Monitoring	Not applied
Remarks - Method	The test was conducted according to the guidelines above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported. The above stated test guideline is very similar to OECD TG 202. The ecotoxicity test was conducted in Water Accommodated Fractions

(WAFs) of the notified chemical as it is a complex mixture and has low water solubility. Water Accommodated Fractions (WAFs) containing the test substance for all treatments were prepared in micro-filtered natural seawater. The mixtures were gently stirred for approximately 20 hours, following by a settling period sufficient to achieve complete separation of phases. The middle clear phase was siphoned and used as treatment solution.

RESULTS

Nominal Concentration (WAF;mg/L)	*Number of Copepods*	*% Immobilised (48 h)*
Control	320	0
3000	320	0

LC50	> 3000 mg/L at 48 hours (WAF)
NOEL	3000 mg/L at 48 hours (WAF)
Remarks - Results	All validity criteria for the test were satisfied. The ecotoxicity test was conducted as a limit test. The endpoints (48 h) were determined based on visual observations.

CONCLUSION The notified chemical was not harmful at saturation to aquatic invertebrates

TEST FACILITY Baroid (2011b)

A.2.3. Acute toxicity to sediment re-worker amphipod

TEST SUBSTANCE Notified chemical

METHOD Semi-Static Acute Toxicity Test Following Paris Commission (PARCOM) Method (1995)

Species	Sediment re-worker amphipod (*Corophium volutator*)
Exposure Period	10 days
Auxiliary Solvent	Not applied
Salinity	36 – 40 ppt
Analytical Monitoring	Not applied
Remarks - Method	The test was conducted according to the guidelines above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported.

RESULTS

Nominal Concentration (mg/kg dry soil)	*Number of C. volutator*	*% Mortality 10 day*
Control	100	6%
13.77	60	Not reported
137.05	60	Not reported
425.84	60	Not reported
1330.01	60	Not reported
12469.47	60	Not reported

LC50	> 12,469.5 mg/kg dried sediment (10 day)
NOEL	12,469.5 mg/kg dried sediment (10 day)
Remarks - Results	All validity criteria for the test were satisfied. The 10 day LC50 and NOEC values are calculated using an appropriate statistical method from the ToxCalc Version 5 software.

CONCLUSION The notified chemical is not harmful to the sediment re-worker amphipod

TEST FACILITY Opus (2012)

A.2.4. Algal growth inhibition test 1

TEST SUBSTANCE Notified chemical

METHOD ISO 10253 guideline as adapted for marine testing of offshore chemicals
Species Marine Alga (*Skeletonema costatum*)
Exposure Period 72 hours
Concentration Range Nominal: 10.0, 17.8, 31.6, 56.2, 100.0 mg/L
Auxiliary Solvent Not reported
Salinity 30.5 –32.7%
Analytical Monitoring Not reported
Remarks - Method The test was conducted according to the guidelines above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported. The test method was similar to OECD TG 201 Alga, Growth Inhibition Test.

Water Accommodated Fractions (WAFs) containing the test substance for all treatment concentrations were prepared in prepared test media. The mixtures were gently stirred for approximately 20 hours, following by a settling period of at least one hour. The middle clear phase was siphoned and used as treatment solution.

RESULTS

Biomass (72 h)		*Growth (72 h)*	
E_yL50 (mg/L)	*NOE_yL (mg/L)*	*E_rL50 (mg/L)*	*NOE_rL (mg/L)*
12.9	5	14.5	10

Remarks - Results All validity criteria for the test were satisfied.

CONCLUSION The notified chemical was not harmful at saturation to algae

TEST FACILITY Baroid (2010b)

A.2.5. Algal growth inhibition test 2

TEST SUBSTANCE Notified chemical

METHOD OECD TG 201 Alga, Growth Inhibition Test – Static
Species Marine Alga (*Skeletonema costatum*)
Exposure Period 72 hours
Concentration Range Nominal: 10.0, 17.8, 31.6, 56.2, 100.0 mg/L
Auxiliary Solvent Not reported
Salinity 30.3 –31.4%
Analytical Monitoring Not reported
Remarks - Method The test was conducted according to the guidelines above and good laboratory practice (GLP) principles. No significant deviations from the test guidelines were reported.

Water Accommodated Fractions (WAFs) containing the test substance for all treatment concentrations were prepared in prepared test media. The mixtures were gently stirred for approximately 20 hours, following by a settling period of at least one hour. The middle clear phase was siphoned and used as treatment solution.

RESULTS

Biomass (72 h)		*Growth (72 h)*	
E_yL50 (mg/L)	*NOE_yL (mg/L)*	*E_rL50 (mg/L)*	*NOE_rL (mg/L)*
23	15	22	15

Remarks - Results	All validity criteria for the test were satisfied.
CONCLUSION	The notified chemical was not harmful at saturation to algae
TEST FACILITY	Baroid (2011c)

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