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November 2013

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Surfactant Precursor C-300

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (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:

Street Address:	Level 7, 260 Elizabeth Street, SURRY HILLS NSW 2010, AUSTRALIA.
Postal Address:	GPO Box 58, SYDNEY NSW 2001, AUSTRALIA.
TEL:	+ 61 2 8577 8800
FAX	+ 61 2 8577 8888
Website:	www.nicnas.gov.au

Director
NICNAS

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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/1486	Huntsman Corporation Australia Pty Ltd	Surfactant Precursor C-300	Yes	≤ 2,000 tonnes per annum	A raw material for chemical synthesis

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
Based on the available information, the notified chemical is 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. The recommended hazard classification is presented in the following table.

Hazard classification	*Hazard statement*
Acute Toxicity (Category 4)	H302 – Harmful if swallowed
Skin Corrosion (Sub-category 1B)	H314 – Causes severe skin burns and eye damage
Specific Target Organ Toxicity (Repeated Exposure Category 2)	H373 – May cause damage to organs through prolonged or repeated exposure

Based on the available information, the notified chemical is recommended for hazard classification according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004), with the following risk phrase(s):

R22: Harmful if swallowed
R35: Causes burns
R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed

The environmental hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals* (GHS) is presented below. Environmental classification under the GHS is not mandated in Australia and carries no legal status but is presented for information purposes.

Hazard classification	*Hazard statement*
Acute category 1	H400 – Very toxic to aquatic life
Chronic category	H410 – Very toxic to aquatic life with long lasting effects

Human health risk assessment
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
On the basis of the PEC/PNEC ratio and the assessed use pattern, the notified chemical is not considered to pose an unreasonable risk to the environment.

Recommendations

REGULATORY CONTROLS

Hazard Classification and Labelling

- The notified chemical should be classified as follows:
  - Acute Toxicity (Category 4): H302 – Harmful if swallowed
  - Skin Corrosion (Sub-category 1B): H314 – Causes severe skin burns and eye damage
  - Specific Target Organ Toxicity (Repeated Exposure Category 2): H373 – May cause damage to organs through prolonged or repeated exposure

(Material) Safety Data Sheet

- The (M)SDS provided by the notifier should be amended to reflect the hazard classification stated above.

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 as introduced:
  - Enclosed, automated processes, where possible

- 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 as introduced:
  - Avoid contact with skin and eyes
  - Avoid generation and inhalation of aerosols

- 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 as introduced:
  - Protective clothing
  - Safety glasses/goggles/face shield
  - Respiratory protection when aerosols may be generated

  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

- The notified chemical should be disposed of to landfill.

Storage

- The handling and storage of the notified chemical should be in accordance with the Safe Work Australia Code of Practice for *Managing Risks of Hazardous Chemicals in the Workplace* (SWA, 2012) or relevant State or Territory Code of Practice.

Emergency procedures

- Spills or accidental release of the notified chemical should be handled by physical containment, collection and subsequent safe 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(2) of the Act; if
- the function or use of the chemical has changed from a raw material for chemical synthesis, 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.

No additional secondary notification conditions are stipulated.

(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)
Huntsman Corporation Australia Pty Ltd (ABN: 67 083 984 187)
Gate 3, 765 Ballarat Road
DEER PARK VIC 3023

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: chemical name, other names, CAS number, molecular and structural formulae, molecular weight, analytical data, degree of purity, impurities, import volume and identity of manufacturer/recipients.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows: All physico-chemical endpoints except melting point, density, vapour pressure, water solubility and flash point, acute inhalation toxicity, genotoxicity, repeated dose toxicity, ready biodegradability and all ecotoxicological endpoints.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Surfactant precursor C 300

MOLECULAR WEIGHT
< 500 Da

ANALYTICAL DATA
Reference NMR and IR spectra were provided.

3. COMPOSITION

DEGREE OF PURITY
> 95%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Clear to slightly hazy liquid

Property	Value	Data Source/Justification
Pour Point	-17 °C	TDS
Boiling Point	> 250 °C at 101.3 kPa	Estimated using the largest component that was used to synthesize the notified chemical.
Density	907 kg/m^3 at 25 °C	TDS
Vapour Pressure	2.05 kPa at 205 °C	TDS
Viscosity	15.4 mm^2/s at 20 °C 7.8 mm^2/s at 38 °C 4.3 mm^2/s at 66 °C	TDS
Water Solubility	Not determined	Calculated to be 0.59 mg/L using WSKOW v1.42, EPI Suite v4.1 (US

		EPA, 2010). However, the notified chemical may disperse in water based on its surface activity.
Hydrolysis as a Function of pH	Not determined	Not expected as the notified chemical does not contain any readily hydrolysable functionalities.
Partition Coefficient (n-octanol/water)	Not determined	Calculated log Pow = 6.03 for the unionised form of the notified chemical using KOWIN v1.68, EPI Suite v4.1 (US EPA, 2010). However, the notified chemical may partition to phase boundaries based on its surface activity.
Adsorption/Desorption	Not determined	Calculated log K_{oc} = 4.46 for the unionised form of the notified chemical using KOCWIN v2.0, EPI Suite v4.1 (US EPA, 2010). Expected to sorb to soil, sediment and sludge due to its surface activity.
Dissociation Constant	Not determined	The notified chemical contains a cationic functional group that has potential to be ionised under environmental conditions (pH 4-9).
Flash Point	355 °C (open cup method)	TDS
Autoignition Temperature	Not determined	Expected to be high based on the flashpoint.
Explosive Properties	Not determined	The structural formula contains no explosophores that would imply explosive properties.
Oxidising Properties	Not determined	The notified chemical contains no functional groups that would imply oxidative properties.

DISCUSSION OF PROPERTIES

Reactivity
The notified chemical is expected to be stable under normal conditions of use, but is very reactive in contact with acids.

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 as a raw material at a concentration of > 95%.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	1,000 – 2,000	1,000 – 2,000	1,000 – 2,000	1,000 – 2,000	1,000 – 2,000

PORT OF ENTRY
Port Botany, NSW.

TRANSPORTATION AND PACKAGING
The notified chemical will be transported from the port to the surfactants plant by road in 20,000 L isotainers.

USE
The notified chemical will be used as a raw material for the chemical synthesis of surfactants for use as wetting agents in agricultural formulations and dispersants in cleaning formulations.

OPERATION DESCRIPTION
After importation, the isotainers containing the notified chemical will be transported to the surfactant synthesis site where they will be connected to transfer lines and the notified chemical pumped into bulk storage tanks. The notified chemical will be pumped through dedicated transfer lines from the storage tanks to closed reaction vessels where it will be reacted with a variety of different chemicals depending on the intended product at temperatures from 120 – 150 °C. Batches will be approximately 5 – 27 tonnes with consecutive runs of approximately 5 batches between reactor rinsings. After the synthesis is complete the wetting agents and dispersants will be pumped through pipes to the filling line where it will be packed into 205 L drums or intermediate bulk containers. The notified chemical is expected to be present at concentrations of < 10 ppm in the synthesised wetting agents and dispersants.

The wetting agents will be used at concentrations of 5 – 15% w/w in herbicide formulations in both agricultural and home garden settings. The dispersants will be used at concentrations of 1 – 2% w/w in liquid laundry detergent formulations.

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)*
Transport	1	60
Plant process operators	1	120
Quality assurance	1	120
Maintenance	1	12

EXPOSURE DETAILS
It is anticipated that transport personnel would only be exposed to the notified chemical in the event of an accident.

Dermal and ocular exposure to the notified chemical at a concentration of > 95% will be possible during the connection and disconnection of transfer lines to the imported isotainers, and during cleaning processes. Dermal and ocular exposure is expected to be limited by the use of personal protective equipment (PPE) including gloves, protective clothing and goggles or a face shield. Inhalation exposure is not expected as the notified chemical is expected to have a low vapour pressure at ambient temperatures. Workers are not expected to be exposed to the notified chemical during the synthesis of the wetting agents or dispersants as this will be a closed process but may be exposed to residual amounts (< 10 ppm) of the notified chemical during the packaging of the synthesised chemicals. Workers may also be exposed to residual amounts (< 10 ppm) of the notified chemical when using products containing the wetting agents or dispersants synthesised from it.

6.1.2. Public Exposure
The notified chemical is intended for industrial use only, and will not be available to the public. Direct exposure would therefore not be expected.

Members of the public may come into contact with products containing chemicals that have been synthesised using the notified chemical. In these products the notified chemical will be present at a maximum concentration of < 2 ppm.

6.2. Human Health Effects Assessment

The results from toxicological investigations conducted on the notified chemical are summarised in the following table. For full details of the studies, refer to Appendix A.

Endpoint	*Result and Assessment Conclusion*
Rat, acute oral toxicity	LD50 1,308 mg/kg bw; harmful
Rat, acute dermal toxicity	LD50 > 2,000 mg/kg bw; low toxicity
Rabbit, skin irritation	corrosive
Guinea pig, skin sensitisation – non-adjuvant test	no evidence of sensitisation

Toxicokinetics, metabolism and distribution.
The notified chemical has a low molecular weight (< 500 Da) and is lipophilic with an expected low water solubility (calculated to be 0.59 mg/L) and high partition coefficient (calculated Pow = 6.03). The notified chemical is therefore expected to be absorbed from the gastrointestinal tract although dermal absorption may be limited by slow transfer between the stratum corneum and the epidermis. This is supported by evidence of systemic toxicity at high doses in an acute oral toxicity study and in 90-day repeated dose oral toxicity studies on analogue chemicals. The corrosive nature of the notified chemical will assist in it being absorbed across biological membranes.

Acute toxicity.
The notified chemical was found to be harmful to rats after a single oral dose with an LD50 of 1,308 mg/kg bw. Following a single dermal administration of 2,000 mg/kg bw of the notified chemical to 10 rabbits there was one death with red lungs and mottled kidneys observed in this animal at necropsy. Signs of skin corrosion at the test substance application site was observed in all animals. Based on the results of this study, the notified chemical is of low acute dermal toxicity.

There were no acute inhalation toxicity studies available for the notified chemical. Analogue 1 was found to have an LC50 of > 0.099 mg/L from a 1 hour whole body inhalation exposure in rats (ECHA, 2011). Symptoms observed during this acute inhalation study included irritation around the muzzle, red areas on the fur, hypoactivity and minimal to slight peribronchial lymphoid hyperplasia in the lung. All rats exhibited normal appearance and behaviour during the 14-day post-exposure observation period.

Irritation and sensitisation.
The notified chemical was corrosive when applied to the skin of rabbits.

There were no eye irritation studies available for the notified chemical. However, given the notified chemical is corrosive to the skin an eye irritation study need not be performed and the notified chemical can be considered as a corrosive eye irritant. This is supported by results from studies conducted on analogue 2 and analogue 3 which were both found to be corrosive to the eye (ECHA, 2011). Analogue 2 applied to the eyes of three rabbits produced pronounced conjunctiva redness and chemosis with severe cornea opacity and moderate iris lesions, with the effects not reversible within the observation period of 21 days. Analogue 3 was applied to the eye of one rabbit and produced red discolouration of the conjunctiva, pronounced chemosis and lesions on the iris and cornea. Due to vascularisation of the eye the study with analogue 3 was terminated after 7 days.

In a Buehler test with the guinea pigs there was no evidence of skin sensitisation caused by the notified chemical.

Repeated Dose Toxicity.
There was no repeated dose toxicity data available for the notified chemical.

In a 28 day gavage study with rats on analogue 4, effects (histiocytic vacuolation of the mesenteric lymph nodes and small intestine) were seen at the lowest dose tested (12.5 mg/kg bw/day) with deaths seen at higher doses (ECHA, 2011). The effects seen in this study with analogue 4 were predominantly related to corrosion of the stomach and intestines by the test substance although lung effects were also present due to accidental aspiration of the test material.

There are a number of studies with analogue 3 in both rats and dogs (ECHA, 2011). In rats fed analogue 3 as part of their diet for 209 days at doses of 88 – 138 mg/kg bw/day (3,000 ppm) a range of effects predominantly

due to corrosion were seen in the mesenteric lymph nodes, stomach and intestines although liver effects were also seen along with pulmonary infection. In a 2 year feeding study with analogue 3 at a range of doses the NOAEL was set at 10 mg/kg bw/day based on histiocytic hyperplasia in the mesenteric lymph node. In a one year toxicity study in dogs the NOAEL was set at 3 mg/kg bw/day based on the death through anorexia and haemorrhagic diarrhoea, growth depression and lymph node histiocytosis at higher dose levels.

In a 28 day gavage study with analogue 5 on 5 rats per sex dose rates of 50 mg/kg bw/day produced gait abnormalities, reductions in body weight and effects in the liver and kidneys (ECHA, 2011). At dose rates of 12.5 mg/kg bw/day analogue 5 induced significantly lower bodyweight and increased urea nitrogen leading to the NOAEL being set at the lower dose of 3.25 mg/kg bw/day.

The effects seen in rats and dogs following repeated exposure to the analogue chemicals indicate that the notified chemical is expected to cause a range of adverse systemic and local effects following repeated exposure at doses down to 12.5 mg/kg bw/day with the lowest NOAEL for these analogue chemicals being 3.25 mg/kg bw/day.

Mutagenicity/Genotoxicity.
There was no data available on mutagenicity or genotoxicity for the notified chemical.

Analogues 1, 3, 4, 5 were found to be non-mutagenic to bacteria both with and without metabolic activation (ECHA, 2011).

Analogue 5 was non-mutagenic in a L5178Y TK+/- mouse lymphoma assay and at the hrpt locus in Chinese hamster ovary (CHO) cells (ECHA, 2011). In addition analogue 5 did not induce chromosomal aberrations in CHO cells both with and without metabolic activation (ECHA, 2011). Analogue 5 did not induce chromosomal aberrations in mice bone marrow cells after single doses up to 5,000 mg/kg bw (ECHA, 2011).

Analogue 4 administered to rats at a single dose of 2,000 mg/kg bw produced a negative result in a bone marrow micronucleus test (ECHA, 2011).

The results of the studies on the analogue chemicals do not indicate a concern for mutagenicity/genotoxicity for the notified chemical.

Toxicity for reproduction.
There was no data available on the reproductive and developmental toxicity of the notified chemical.

A developmental toxicity screening test was conducted with analogue 4 found no test substance related, statistically significant developmental effects at doses where there was not significant maternal toxicity with the NOAEL being 12.5 mg/kg bw/day (ECHA, 2011). At higher doses where maternal toxicity including death was present, changes in the weight of reproductive organs relative to the body weight, the number of live pups and pup weight were affected.

Analogue 5 administered to pregnant rats at concentrations up to 80 mg/kg bw/day on gestation days 6 to 15 did not result in developmental toxicity effects (ECHA, 2011). Analogue 5 was also tested on pregnant rabbits at doses of 3, 10 or 30 mg/kg bw/day on gestation days 6 to 18. Clinical signs and reduced body weight gain in treated animals at the higher doses resulted in a maternal NOAEL of 3 mg/kg bw/day, however no developmental effects were seen at any dose level.

Based on the reproductive and developmental data for analogues 4 and 5 the notified chemical is not expected to be a developmental or reproductive toxicant.

Health hazard classification
Based on the available information, the notified chemical is 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. The recommended hazard classification is presented in the following table.

Hazard classification	*Hazard statement*
Acute Toxicity (Category 4)	H302 – Harmful if swallowed
Skin Corrosion (Sub-category 1B)	H314 – Causes severe skin burns and eye damage

Specific Target Organ Toxicity (Repeated Exposure Category 2)	H373 – May cause damage to organs through prolonged or repeated exposure

Based on the available information, the notified chemical is recommended for hazard classification according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004), with the following risk phrase(s):

R22: Harmful if swallowed
R35: Causes severe burns
R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

The notified chemical is harmful by the oral route and is corrosive. Based on data for analogous chemicals the notified chemical is also expected to be toxic following repeated oral exposure with the NOAEL for the analogous chemicals being as low as 3.25 mg/kg bw/day. Long term toxicity by the dermal and inhalation routes for the notified chemical are not known. Due to both the local and systemic toxicity of the notified chemical its use is only considered to be reasonable when sufficient engineering controls, safe work practices and personal protective equipment (PPE) are used to greatly reduce the potential for exposure.

During the synthesis of wetting agents and dispersants dermal and ocular exposure to the notified chemical at a concentration of > 95% will be possible. Exposure will be limited by the largely automated and enclosed processes and the use of PPE including gloves, protective clothing and goggles or a face shield. Inhalation exposure by workers to the notified chemical is not expected as the vapour pressure of the notified chemical at ambient temperatures is predicted to be low and the largely enclosed processes reduce the potential for exposure to aerosols. Provided that adequate PPE is used and engineering controls are in place to limit exposure, the risk to the health of reformulation workers is not considered to be unreasonable.

Workers may be exposed to residual amounts (< 10 ppm) of the notified chemical during the packaging of the synthesised wetting agents or dispersants or the use of products containing them. At concentrations of < 10 ppm the notified chemical is not expected to be hazardous and therefore the risk to workers exposed to chemicals or products containing residual amounts 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 at concentrations of > 2 ppm; hence, the risk to public health is not considered to be unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The imported notified chemical will be used as raw material for the manufacture of wetting agent used in herbicide formulations or for the manufacture of dispersant used in cleaning formulations. At the industrial sites, the notified chemical will react with a variety of different chemicals in closed reaction vessels. The only release of the notified chemical to the environment may result from the cleaning of reactors. It is estimated by the notifier that approximately 0.03 kg/day of the notified chemical may be released as industrial waste water from the cleaning of reactors.

After the synthesis is complete, the produced wetting agent and dispersant are expected to contain very low levels of the notified chemical (< 10 ppm) as the notified chemical has reacted with other chemicals during the synthesis processes. The synthesised wetting agent will be used at concentrations of 5-15% in herbicide formulations and the dispersant will be used at concentrations of 1-2% in liquid laundry detergent formulations, respectively. No significant release of the notified chemical to the environment is expected from these further reformulation processes given that the concentration of the notified chemical in the wetting agent and dispersant is very low.

RELEASE OF CHEMICAL FROM USE

The reformulated herbicide products containing the notified chemical (< 1.5 ppm) will be used in both agricultural and home garden settings. It is estimated by the notifier that approximately 0.04 kg/day of the notified chemical may be released to crop land when applying herbicide products to plants. This release will occur nationwide and is expected to be extremely dispersed.

The reformulated laundry products containing the notified chemical will be predominately released to sewers after their use. However, the amounts of the notified chemical released to sewers are expected to be negligible as the laundry products contain very low levels of the notified chemical (< 0.2 ppm).

RELEASE OF CHEMICAL FROM DISPOSAL

Limited amounts of the notified chemical may remain as residues in empty containers, which are expected to be disposed of to landfill along with the empty containers.

7.1.2. Environmental Fate

No environmental fate data were submitted for the notified chemical. Based on the biodegradability result obtained for the analogue chemical (readily biodegradable but failing the 10-day window), the notified chemical is likely to rapidly biodegrade and is not expected to persist in the environment. The analogue chemical is considered to be acceptable with respect to biodegradation given it has the same functional groups as the notified chemical.

The majority of the notified chemical will react with other chemicals during the manufacture of wetting agent for herbicide formulations and dispersant for detergent formulations. Unreacted notified chemical contained in dispersant, if any, will share the fate of the detergent and be released to sewers nationwide. At the sewage treatment plants (STP), the notified chemical is expected to be partially removed from water column via biodegradation, based on the biodegradability result for the analogue, or by sorption to sludge, based on its potential cationicity and surfactant properties. Sludge containing residual notified chemical will be disposed of to landfill or applied to agricultural soils. Therefore, no significant release of the notified chemical to surface waters is expected from this pathway. Trace levels of unreacted notified chemical contained in wetting agent will share the fate of herbicides and be applied to plants. The majority of the unreacted notified chemical will be released to the terrestrial environment. The notified chemical is not expected to mobile in soil based on its potential cationicity and surfactant properties. In landfill, soil and water, the notified chemical is expected to degrade via abiotic or biotic pathways to form water, oxides of carbon and nitrogen.

The notified chemical has a low molecular weight (< 500 Da) and its estimated partition coefficient (n-octanol/water) is relatively high. However, the notified chemical is not expected to bioaccumulate significantly in aquatic organisms based on its surfactant properties and estimated bioconcentration factor for the notified chemical (BCF = 187, BCFBAF v3.01, EPI Suite 4.1 (US EPA 2010)).

7.1.3. Predicted Environmental Concentration (PEC)

The release of the notified chemical to the water compartment may result from the cleaning of reactors during the manufacture processes or from the use of the detergent products which may contain traces of the notified chemical. The detergent products only contain < 0.2ppm of the notified chemical and the release of the notified chemical from this pathway is expected to be dispersed nationwide. This release is considered negligible when compared to the release of the notified chemical from the cleaning of reactors. Therefore, the Predicted Environmental Concentration (PEC) has been calculated only based on the point-source release of the notified chemical from the cleaning of the reactors.

It is estimated by the notifier that 0.03 kg/day of the notified chemical will be released as industrial waste water to a single site STP with flow capacity of 456 ML/day. Based on its biodegradation potential (rapidly biodegradable over 28 days for the analogue chemical), more than 67% of the notified chemical is estimated to be removed from the STP effluent by degradation based on SimpleTreat data (European Commission, 2003). Under a worst case scenario, the PEC has been calculated for both riverine and ocean as summarised in the table below.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Daily chemical release:	0.03	kg/day
Individual Sewage Treatment Plant Average Daily Flow:	456	ML/day
Removal within STP	67%	
Dilution Factor - River	1	

Dilution Factor - Ocean	10	
PEC - River:	0.022	
PEC - Ocean:	0.0022	µg/L

STP effluent re-use for irrigation occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1000 L/m^2/year (10 ML/ha/year). The notified chemical in this volume is assumed to infiltrate and accumulate in the top 10 cm of soil (density 1500 kg/m^3). Using these assumptions, irrigation with a concentration of 0.022 µg/L may potentially result in a soil concentration of approximately 0.14 µg/kg. Assuming accumulation of the notified chemical in soil for 5 and 10 years under repeated irrigation, the concentration of notified chemical in the applied soil in 5 and 10 years may be approximately 0.73 µg/kg and 1.45 µg/kg, respectively.

7.2. Environmental Effects Assessment

No ecotoxicity data were submitted for the notified chemical. As the notified chemical contains functional groups that have a demonstrated acute and chronic toxicity to aquatic organisms, the ecotoxicity effects of the notified chemical were predicted using ECOlogical Structure Activity relationship (ECOSAR v1.11, US EPA 2012) for the representative components. The conservative toxicity results are summarised in the table below. The results of ecotoxicological investigations for the analogue chemicals are also summarised in the table below.

The measured ecotoxicity endpoints for the analogue chemicals provided by the notifier were found to be consistent with ECOSAR calculations, and hence ECOSAR is considered acceptable for the estimation of the toxicity effects of the notified chemical on the environment for the purpose of risk assessment.

Endpoint	Result	Assessment Conclusion
Acute analogue toxicity		
Fish	LC50 (96 h) = 0.06 - 0.88 mg/L	Very toxic to fish
Daphnia	EC50 (48 h) = 0.011- 0.016 mg/L	Very toxic to aquatic invertebrates
Algae	E_rC50 (96 h) = 0.04 - 0.17 mg/L	Very toxic to aquatic algae
ECOSAR predication for the notified chemical		
Acute toxicity		
Fish	LC50 (96 h) = 0.14 mg/L	Potentially very toxic to fish
Daphnia	LC50 (48 h) = 0.03 mg/L	Potentially very toxic to aquatic invertebrates
Algal	EC50 (96 h) = 0.009 mg/L	Potentially very toxic to algae
Chronic toxicity		
Fish	ChV* = 0.002 mg/L	Potentially very toxic to fish with long lasting effects
Daphnia	ChV* = 0.004 mg/L	Potentially very toxic to aquatic invertebrates with long lasting effects
Algae	ChV* = 0.004 mg/L	Potentially very toxic to algae with long lasting effects

** ChV = Chronic value = $(NOEC \times LOEC)^{1/2}$

Both the analogue and modelling data indicate the notified chemical is potentially very toxic to fish, aquatic invertebrates and algae under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS; United Nations, 2009). Therefore, the notified chemical is formally classified under the GHS as “Acute category 1; Very toxic to aquatic life”.

The notified chemical is acutely very toxic to aquatic life and rapidly biodegradable. Based on it acute toxicity, biodegradability and the log Pow, the notified chemical is considered to be potentially very toxic to aquatic life with long lasting effects. This classification is also consistent with the conclusion derived from the modelling chronic endpoints. Therefore, the notified chemical is formally classified as as “Chronic category 1; Very toxic to aquatic life with long lasting effects” under the GHS.

7.2.1. Predicted No-Effect Concentration

The Predicted No-Effect concentration (PNEC) has been calculated from the most conservative endpoint (Fish, ChV = 0.002) for the notified chemical and an assessment factor of 50. A conservative assessment factor 50 is

considered appropriate for this assessment as although chronic endpoints (ChV = (LOEC × NOEC)^{½}) for three trophic levels are available, these chronic endpoints are greater than no-observed effect concentrations (NOECs).

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
ChV (Fish).	0.002	mg/L
Assessment Factor	50	
PNEC:	0.04	µg/L

7.3. Environmental Risk Assessment

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River:	0.022	0.04	0.55
Q - Ocean:	0.0022	0.04	0.055

The risk quotient (Q = PEC/PNEC) for riverine and ocean environments are calculated to be <1 based on the calculated PEC and PNEC values. Based on its surfactant properties and the estimated bioconcentration, the notified chemical is not expected to bioaccumulate significantly in aquatic organisms. Furthermore, the notified chemical is not expected to persist in the environment. On the basis of PEC/PNEC ratio and the assessed use pattern, the notified chemical is not expected to be released at ecotoxicologically significant concentrations in the aquatic environment and is therefore not considered to pose an unreasonable risk to the aquatic environment.

APPENDIX A: TOXICOLOGICAL INVESTIGATIONS

B.1. Acute toxicity – oral

TEST SUBSTANCE	Notified chemical
METHOD	Method similar to OECD TG 401 Acute Oral Toxicity.
Species/Strain	Rat/Sprague Dawley
Vehicle	Water
Remarks - Method	Prior to the main study a dose –range-finding study was conducted with 3 rats per sex per dose at 500, 2500 and 5000 mg/kg.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	5 per sex	1,000	1/10
II	5 per sex	1,500	7/10
III	5 per sex	2,000	10/10

LD50	1,308 mg/kg bw
Signs of Toxicity	A single female animal in the 1,000 mg/kg dose group died on day 5, in the 1,500 mg/kg dose group 4 female and 3 male animals died on days 2-6, while in the 2,000 mg/kg dose group all animals were dead by day 5. Signs of toxicity at all dose levels included decreased activity/body tone, abnormal gait/stance, piloerection, poor grooming, soft/watery stools and dark areas around the eyes/nose. Additional clinical signs at 1,000 mg/kg included dry eyes and hair loss, at 1,500 mg/kg body quivers and eye closure were observed, while at 2,000 mg/kg prostration was observed.
Effects in Organs	No abnormalities were noted at necroscopy in any of the animals that survived till the end of the study. In animals that died during the study the effects seen were predominantly related to the stomach and intestines and included; fluid filled intestines, pale/yellow intestines, distended stomach/intestines and red lesions on the stomach lining. Other effects included dark/yellow discharge around the mouth, nose and anus, mottled lungs, bright red lungs and mottled liver.
Remarks - Results	Body weights were reduced in all of the animals that died before the end of the study, but increased in the animals that survived.

CONCLUSION	The notified chemical is harmful via the oral route.
TEST FACILITY	Chrysalis (2002a)

B.2. Acute toxicity – dermal

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 402 Acute Dermal Toxicity.
Species/Strain	Rabbit/New Zealand White – HM(NZW)fBR
Vehicle	Test substance administered as supplied.
Type of dressing	Not specified
Remarks - Method	No significant protocol deviations.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	5 per sex	2,000	1/10

LD50	> 2,000 mg/kg bw
Signs of Toxicity - Local	Erythema, oedema, necrosis, fissuring and sloughing of the skin were present at the test substance application site.
Signs of Toxicity - Systemic	One male animal was found dead on day 8. Clinical signs observed during the test included abnormal gait and stance, decreased activity/body tone and poor grooming.
Effects in Organs	The animal that died on day 8 exhibited mottled kidneys and bright red lungs. No visible lesions were noted in any of the animals that survived to the end of the study.
Remarks - Results	Body weight losses were present on day 8 in all but 1 of the surviving animals.

CONCLUSION The notified chemical is of low toxicity via the dermal route.

TEST FACILITY Chrysalis (2002b)

B.3. Irritation – skin

TEST SUBSTANCE Notified chemical

METHOD Similar to OECD TG 404 Acute Dermal Irritation/Corrosion.

Species/Strain	Rabbit/New Zealand White
Number of Animals	6 (3 per sex)
Vehicle	Test substance administered as supplied
Observation Period	15 Days
Type of Dressing	Semi-occlusive
Remarks - Method	The test substance was applied to three different sites on each rabbit with each site having a different exposure period. The exposure periods were 3 minutes, 1 hour or 4 hours.

RESULTS

Lesion	*Mean Score**	*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
Erythema/Eschar	3.94	4	> 15 days	4
Oedema	3.89	4	> 15 days	4

*Calculated on the basis of the scores at 24, 48, and 72 hours for ALL animals. The results are for the 4 hour exposure sites.

Remarks - Results

There were no mortalities during the course of the study. The 4 hour exposure sites showed very slight erythema and very slight to slight oedema immediately after the dressings were removed. After 24 hours the erythema and oedema had increased to moderate to severe with necrosis also present. At the day 2 observation severe erythema and oedema was observed in all animals. Fissuring of the skin started to be observed at the day 10 observation and sloughing of the skin at the day 12 observation. At the day 15 observation the 4 hour exposure sites showed severe erythema, severe oedema, necrosis, fissuring and sloughing in all the test animals.

In the 3 minute and 1 hour exposure sites severe erythema and oedema was not present in all animals until the day 3 observation but by the end of the study the effects were equivalent to those observed in the 4 hour exposure site.

A body weight loss over the course of the study was observed in 1 male animal.

CONCLUSION The notified chemical is corrosive to the skin.

TEST FACILITY Chrysalis (2002c)

B.4. Skin sensitisation

TEST SUBSTANCE: Notified chemical

METHOD: OECD TG 406 Skin Sensitisation - Buehler.

Species/Strain: Guinea pig/Hartley – Elm:(HA)

PRELIMINARY STUDY: Maximum Non-irritating Concentration:
topical: 1%

MAIN STUDY

Number of Animals: Test Group: 20 (10 per sex) Control Group: 10 (5 per sex)

INDUCTION PHASE: Induction Concentration:
topical: 3%

Signs of Irritation: Of the animals treated topically with the test substance at a concentration of 3% 17/20 showed signs of irritation ranging from slight/moderate patchy erythema to severe erythema/oedema and necrosis.

CHALLENGE PHASE

1st challenge: topical: 1%

2nd challenge: topical: 0.5%

Remarks - Method: Water was used as the vehicle.

A dose range finding study was initially conducted with 4 animals (2 per sex) at concentrations of 10%, 25%, 50% and 100%. At these concentrations severe erythema and oedema was observed with necrosis of the skin also reported. A second dose range finding study was therefore conducted with 4 more animals (2 per sex) at concentrations of 0.5%, 1%, 3% and 5%. At 3% concentration severe erythema was seen in 1 animal with slight to moderate patchy erythema in a second animal, while at 1% concentration no signs of irritation were present. At 0.5% one animal had slight patchy erythema. A rechallenge was performed 7 days after the first challenge. For the rechallenge 4 (2 per sex) more animals were used for the control group.

The positive control was 1-chloro-2,4-dinitrobenzene (DNCB).

RESULTS

Animal	*Challenge Concentration*	*Number of Animals Showing Skin Reactions after:*			
		1st challenge		*2nd challenge*	
		24 h	*48 h*	*24 h*	*48 h*
Test Group	1%	3/20	3/20	-	-
	0.5%	-	-	5/20	5/20
Control Group	1%	4/10	4/10	-	-
	0.5%	-	-	0/4	1/4

Remarks - Results: There was no mortality and no clinical signs of toxicity observed in the test subjects, with all animals gaining weight during the study.

In the control group animals the site challenged with distilled water showed no signs of irritation while at the site challenged with the test substance at a concentration of 1% 4/10 animals had irritation ranging from slight patchy erythema to moderate erythema with symptoms more pronounced at the 48 hour observation. In the test group 3/20 animals had slightly patchy to slight erythema at both the 24 and 48 hour observations. In the rechallenge 1/4 animals in the control group had slight to patchy moderate erythema while in the test group 6/20 (2 animals had irritation only at either the 24 or 48 hour observation) animals had irritation ranging from slightly patchy erythema to severe erythema with or without oedema in the rechallenge.

	Although there was a significant level of irritation seen in the test group animals, similar irritation was also seen in the control group animals suggesting the effects were due to the irritant nature of the test substance. The positive control confirmed the sensitivity of the test system.
CONCLUSION	There was no evidence of reactions indicative of skin sensitisation to the notified chemical under the conditions of the test.
TEST FACILITY	Chrysalis (2002d)

BIBLIOGRAPHY

Chrysalis (2002a) Acute Oral Exposure Toxicity Study in Rats (Study No. 0402XH11.008, March, 2002). Olyphant, Pennsylvania, United States of America, Chrysalis Preclinical Services Corporation (Chrysalis) (Unpublished report provided by notifier).

Chrysalis (2002b) Acute Exposure Dermal Toxicity in Rabbits (Study No. 0422XH11.009, March, 2002). Olyphant, Pennsylvania, United States of America, Chrysalis Preclinical Services Corporation (Chrysalis) (Unpublished report provided by notifier).

Chrysalis (2002c) Primary Dermal Irritation (D.O.T.) (Study No. 0420XH11.010, March, 2002). Olyphant, Pennsylvania, United States of America, Chrysalis Preclinical Services Corporation (Chrysalis) (Unpublished report provided by notifier).

Chrysalis (2002d) Delayed Contact Hypersensitivity in Guinea Pigs (Buehler) (Study No. 0424XH11.008, March, 2002). Olyphant, Pennsylvania, United States of America, Chrysalis Preclinical Services Corporation (Chrysalis) (Unpublished report provided by notifier).

European Commission (2003). Technical Guidance Document on Risk Assessment in Support of Commission Directive 93/67/EEC on Risk Assessment for New Notified Substances and Commission Regulation (EC) No 1488/94 on Risk Assessment for Existing Substances and Directive 98/8/EC of the European Parliament and of the Council Concerning the Placing of Biocidal Products on the Market – Part II. Institute for Health and Consumer protection, European Chemicals Bureau, European Communities. <http://ihcp.jrc.ec.europa.eu/our_activities/public-health/risk_assessment_of_Biocides/doc/tgd>. Accessed October 04, 2013

NOHSC (2004) Approved Criteria for Classifying Hazardous Substances, 3rd edition [NOHSC:1008(2004)]. National Occupational Health and Safety Commission, Canberra, AusInfo.

SWA (2012) Code of Practice: Managing Risks of Hazardous Chemicals in the Workplace, Safe Work Australia, http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/managing-risks-of-hazardous-chemicals-in-the-workplace.

United Nations (2009) Globally Harmonised System of Classification and Labelling of Chemicals (GHS), 3rd revised edition. United Nations Economic Commission for Europe (UN/ECE), <http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html >.

US EPA (2010) Estimations Program Interface Suite™ for Microsoft® Windows, v 4.10. United States Environmental Protection Agency. Washington, DC, USA.

US EPA (2012) The ECOSAR (Ecological Structure-Activity Relationship) class program for Microsoft Windows, v 1.11. United States Environmental Protection Agency. Washington, DC, USA.