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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Dabco NE300

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and *Industrial Chemicals (Notification and Assessment) Regulations 1990*. 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 Ageing, 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 and Water Resources.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at 334-336 Illawarra Road, Marrickville NSW 2204.

This Full 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

FULL PUBLIC REPORT

Dabco NE300

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
IMCD Australia Limited (ABN 44 000 005 578)
Level 1 372 Wellington Rd
MULGRAVE VIC 3170

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, Spectral Data, Molecular Weight, Percentage in final Products, Specific Use, Impurities and Import Volume.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None.

NOTIFICATION IN OTHER COUNTRIES
Canada (2006), USA, EU, South Korea.

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Dabco®NE300
Dabco®NE300 Blow Catalyst

ANALYTICAL DATA
Reference NMR, IR, HPLC, and UV spectra were provided.

3. COMPOSITION

DEGREE OF PURITY
>95%

HAZARDOUS IMPURITIES
One impurity was present.

ADDITIVES/ADJUVANTS
None.

4. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa Slightly viscous, colourless to amber liquid.

Property	Value	Data Source/Justification
Freezing Point	<-76°C	Measured
Boiling Point	270°C at 100.7 kPa	Measured
Density	905 kg/m^3 at 20.0°C	Measured
Vapour Pressure	0.0047 kPa at 20°C	Measured
Water Solubility	>978 g/L at 20°C	Measured
Surface Tension	70.3 mN/m at 20.0°C	Measured
Hydrolysis as a Function of pH	$t_{½}$ >365 days The notified chemical is hydrolytically stable.	Measured
Partition Coefficient (n-octanol/water)	log P_{ow} at 20°C = <-3.	Measured
Adsorption/Desorption	log K_{oc} <-0.54	Calculated
Dissociation Constant	pKa = 7.5, 8.9, 9.9	Calculated
Particle Size	The notified chemical is a liquid	N/A
Flash Point	124°C at 101.7 kPa	Measured
Flammability	Does not develop dangerous amounts of flammable gas on contact with water.	Measured
Autoignition Temperature	205°C	Measured
Oxidising Properties	None	Estimated
Pyrophoric Properties	None	Estimated
Explosive Properties	None	Estimated

Discussion of Observed Effects

For full details of the physical-chemical properties tests please refer to Appendix A.

Reactivity

The notified chemical is stable under normal conditions. Thermal decomposition products may include nitric acid, ammonia, carbon oxides and nitrogen oxides.

Dangerous Goods classification

Based on the available data the notified chemical is classified as follows according to the Australian Dangerous Goods Code (FORS, 1998):

Class 8 (Corrosive)

Assessment of the notified chemical was conducted by Environment Canada and Health Canada. The notifier in Canada requested release of the reports for the purposes of this assessment. Environment Canada and Health Canada undertook modelling of the physico-chemical parameters in their assessment of the notified chemical and the results are as follows:

Property	***Value***	***Source***
Solubility in Water	1 x 10^6 mg/L	EPI v. 3.12
	3 x 10^6 mg/L	TSAIES v. 1.25
Octanol/Water Partition	-0.86	Pallas v. 4.0
Coefficient (log K_{ow})	-1.03	EPI v. 3.12
	0.59	ChemDraw v. 8.0
Dissociation Constant (pKa);	Basic groups : 7.46, 8.9 and 9.9	Pallas v. 4.0
Adsorption/Desorption (log K_{oc})	2.033	EPI v. 3.12
Henry's Law Constant (HLC) log HLC	9.64 x 10^{-9} atm-m^3/mol	EPI v. 3.12

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. It will be imported as a neat liquid in 208 L steel drums. The notified chemical will be formulated into polyol blends used in manufacture of polyurethane foams.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	<5	<5	<5	<5	<5

PORT OF ENTRY
Sydney, NSW

IDENTITY OF MANUFACTURER/RECIPIENTS
IMCD Australia Limited, Level 1, 372 Wellington Road, Mulgrave VIC 3170

TRANSPORTATION AND PACKAGING
The notified chemical will be imported 208 L steel drums and transported by road from the port entry by the notifier's contracted service providers, thereafter, any movements locally will by road or rail and will be completed by the notifier's own transport or selected service providers.

USE
The notified chemical is a non-fugitive amine catalyst used in production of polyurethane foam.

OPERATION DESCRIPTION
The notified chemical will be transported by road to the IMCD Australia Limited site where it will be warehoused. It will be freighted by road or rail to customers as required.

The notified chemical will be used at levels below 1 part per hundred parts of polyol in a resin system. The resin system will contain triols, diols, amine crosslinking agents, water, silicone surfactants, flame retardants, pigments, other amine catalysts and process aid additives. The notified chemical will be added to the blending vessel using a pipe, which is added to the drum via a bunghole. Alternatively, the drum will be inverted and emptied to a drip dry state (ie there is no flowable recyclable material in the drum). Once the notified chemical is added, the polyol resin premix is conditioned in the blend tank until it is ready for processing. It is anticipated that the batch size will be approximately 20 tonnes. A small quantity of the premix will be sampled from the blending vessel during the blending process via a sample valve. This sample will undergo quality control testing.

During the polyurethane foaming production process, the resin premix is metered by micro-motion flow detectors and pumped out of the blend tank or "day" tank to a high pressure mechanical impingement mix head. It is at this point that the resin premix is mixed with a diisocyanate. The mixing process usually takes several seconds and the resulting foaming mixture is dispensed from the mix head into an open metal mould (batch process) or onto a conveyor belt (continuous process).

In the batch process, a closed mould injection system is employed depending on the process applied by the manufacturer. The metal moulds are heated at temperatures below 100^{o}C; depending on the type of polyurethane that is produced. Once the premix resin is in the mould, it is allowed to cure or react for less than 10 minutes. The foam product will contain less than 1% notified chemical.

In the continuous process, once the foaming material is applied to the conveyor belt, the mixture rises/foams and emits carbon dioxide. The polymer cures in the solid final product within 10 minutes. From the final product, foam blocks are cut in varying lengths from 3-60 metres for further processing.

After production, articles are often processed further by painting, wrapping in fabric, and the addition of other parts.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure assessment

6.1.1. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Polyol formulation workers	1	2	260
QC testing	1	0.5	260
Foam manufacturing worker	2-4	1	260
Transport and storage	1-2	2	20

Exposure Details

Transportation and storage

Workers involved in transportation and storage of the notified chemical are not expected to be exposed to the notified chemical except in the unlikely event of an accident that results in the rupture of steel drums.

Formulation of polyol

It is estimated that time required to charge the system will be 10 minutes. Dermal and possibly inhalation exposure to the notified chemical may occur during this process. Drips and minor spillage may occur during the connection and disconnection of pipes, which will result in dermal exposure. Workers will wear personal protective equipment such as protective clothing, gloves, chemical goggles and boots to control exposure. Further processing occurs in a closed system that involves no additional human intervention. The workplace will be well ventilated and local exhaust ventilation will be applied when charging the resin system, which will limit any inhalation exposure to the notified chemical from vapour or aerosols.

QC testing

Laboratory staff will generally carry out quality control sampling and testing. Staff will wear laboratory coats, gloves and eye protection during sampling and testing.

Polyurethane foam manufacturing

During the manufacture of the polyurethane foam, the use of an open mould during the batch process will not result in significant exposure to notified chemical, as it will be incorporated into the polyurethane matrix during the making of the foam. This is also the case for the continuous process where, in addition, the conveyor belt is contained within a ventilated canopy structure. Workers will wear personal protective equipment such as protective clothing, gloves, chemical goggles and boots. In cases where there will be potential exposure to isocyanates, workers will wear self-contained breathing protection or organic respirators.

Maintenance and cleaning is not conducted on a routine basis, with blending vessels not always cleaned between batches. When cleaning does occur, no significant exposure is expected as the notified chemical is incorporated in the polyurethane matrix during the making of the foam. Low levels of the notified chemical may remain in residue in pump lines, mixing equipment and pipes and hence wastewater may contain low levels of the notified chemical.

Worker exposure may occur during the cleaning of the drums during the recycling/reconditioning process. It is assumed that the recycling process will take up to 2 hours. In the process, the drum is filled with appropriate cleaning solvent and the content pumped to pits for storage prior to disposal by a licensed waste management company. During the cleaning process, workers will suitable personal protective equipment such as gloves, overalls, boots and protective eyewear.

6.1.2. Public exposure

Exposure to the public during transport, storage, and polyurethane manufacture is expected to be low, except in event of an accidental spill.

Public exposure will occur where dermal contact with damaged articles with exposed polyurethane foam occurs. However, the notified chemical will be cross-linked within the foam polymer matrix and hence will not be bioavailable.

6.2. Human health effects assessment

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

Endpoint	*Result and Assessment Conclusion*
Rat, acute oral	Harmful, LD50 1000 mg/kg bw
Rat, acute dermal	Not conducted (Corrosive)
Rat, acute inhalation	Not conducted (Corrosive)
Rabbit, skin irritation	Corrosive
Rabbit, eye irritation	Not conducted (Corrosive)
Mouse, Local Lymph Node Assay	Evidence of sensitisation.
Rat, oral repeat dose toxicity - 28 days.	NOAEL 150 mg/kg bw/day
Genotoxicity - bacterial reverse mutation	Non-mutagenic
Genotoxicity – *in vitro* chromosomal aberration	Equivocal clastogenicity

The notified chemical was harmful via the oral route in an acute study in rats. In a rat oral repeat dose study in rats a NOAEL of 150 mg/kg bw/day was estimated with local irritant effects on the stomach and organ toxicity in the liver and spleen at 1000 mg/kg bw/day. As the notified chemical was corrosive to rabbit skin, acute dermal toxicity and eye irritation studies were not conducted. Skin sensitisation was observed in a mouse local lymph node assay.
Based on the acute oral toxicity and dermal irritation studies, the notified chemical is classified as hazardous under the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

R22 Harmful if swallowed
R34 Causes burns
R43 May cause sensitisation by skin contact

6.3. Human health risk characterisation

6.3.1. Occupational health and safety

The notified chemical is added to a blending vessel via piping or upending the drum over the vessel to effect addition by gravity feed. Dermal and ocular exposure can occur during these operations.

Dermal exposure to the notified chemical can be estimated based on the EASE model using reasonable worst case defaults for a particular activity (European Commission, 2003) as follows:

Activity	*Estimated exposure for activity <mg/day>*	*Estimated exposure for notified chemical <mg/kg bw/day>**
Manual addition of liquids	420	6
Coupling and decoupling of transfer line	42	0.6
Quality control sampling	21	0.3

* for a 70 kg worker and a 100% dermal absorption factor

Based on a NOAEL of 150 mg/kg bw/day, derived from a 28-day rat oral repeat dose study the margin of exposure (MOE) for various activities are as follows:

Activity	*Estimated exposure for notified chemical <mg/kg bw/day>*	*Margin of Exposure*
Manual addition of liquid form	6	25
Coupling and decoupling of transfer line	0.6	250
Quality control sampling	0.3	500

MOE greater than or equal to 100 are considered acceptable to account for intra- and inter-

species differences. Therefore, the risk of systemic effects using modelled worker data may not be acceptable for workers involved in the manual transfer of the notified chemical in the absence of PPE. The risk is considered to be acceptable with the described use of PPE (gloves, goggles and protective clothing). The fact that the notified chemical is corrosive and sensitising makes the use of PPE mandatory as does the necessity to control exposure to isocyanate. Therefore dermal exposure should be well controlled and the risk of systemic effects for workers manually adding the notified chemical to the mixing vessel should be low. Once in the blending vessel the notified chemical is not expected to be bioavailable following chemical reaction to form polyurethane with little unreacted material.

Transport and storage workers should not come in contact with the notified chemical except in the event of an accident involving rupture of drums.

6.3.2. Public health

There should be a low risk of skin irritation, sensitisation or of systemic effects from the public coming in contact with the notified chemical as it will be crosslinked within the foam.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE

There will be no manufacture of the notified chemical in Australia.

RELEASE OF CHEMICAL FROM USE

The release of the notified chemical to the environment during importation, storage, transport is unlikely. The most likely reason for a release to the environment during these activities will be a transport accident. However, the container capacity and specifications are likely to reduce the extent of release.

Polyurethane manufacture

The release of the notified chemical during polyol reformulation is likely to be limited. Up to 50 kg per year may be left in the import drums when they are emptied. The drums will be disposed of via a licensed waste contractor. Any polyol residues that remain in the process lines at the end of blending (up to 10 kg) will be either recycled or removed by a licensed waste disposal company. Any spills will be contained in the existing bunded areas and removed by a waste disposal company for disposal to landfill. Leaking drums and any clean up material such as rags are likely to be stored on site in oversized containers or drums until removed by a licensed waste disposal company.

Washwater from spill clean up and equipment cleaning (containing up to 100kg of notified chemical) up will be discharged to sewer.

Any out-of-specification foam or off cuts containing the bound notified chemical will be sent to landfill.

During foam production there may be a small amount of the notified chemical released to the atmosphere. This is likely to react with any hydroxyl radicals present.

RELEASE OF CHEMICAL FROM DISPOSAL

Import drums will be rinsed with the resultant effluent, containing up to 50 kg of the notified chemical, being disposed of to sewer. Wastewater from spills (up to 100 kg) and cleaning (up to 10 kg) is likely to be discharged to sewer and subsequently treated at a sewerage treatment plant. Therefore, a total of up to 160 kg of the notified chemical may be disposed of to sewage treatment plants, where it is likely to remain in the water column.

After a container has been rinsed, it will be sent for recycling or disposal to landfill. Contaminated

rags and soil from spill clean ups will be recycled or collected by a waste disposal company for incineration or landfill. Any unused notified chemical or material will be sent to approved recyclers, reclaimers or will be incinerated.

The majority of the polyurethane foam wastes containing the notified chemical will be disposed of to landfill.

7.1.2 Environmental fate

A summary of environmental fate of the notified chemical is presented here. For the details of the environmental fate studies please refer to Appendix C.

The notified chemical is not readily biodegradable. If released to water it is not expected hydrolyse ($t_{½}$ >365 days). In the Environment Canada/Health Canada report (undated), it was estimated that the notified chemical would not volatilise from water surfaces based on the predicted Henry's Law constant of 9.54 x 10^{-9} atm-m^3/mol (EPI). The estimated volatilisation half-life for a model river (1 m deep, flowing 1 m/sec, wind velocity of 5 m/sec) is > 1 year. For a model lake (1 m deep, flowing 0.05 m/sec, wind velocity of 0.5 m/sec) the estimated half-life > 1 year. This indicates that the substance is essentially non-volatile. They also determined that it was non-volatile from moist soil.

Due to its water solubility and log Pow, it is not expected to bioaccumulate. A BCF of 3.162 was estimated by Environment Canada, indicating that the notified chemical was not likely to bioaccumulate.

7.1.3 Predicted Environmental Concentration (PEC)

It is unlikely that the notified chemical will be released to the environment in significant quantities as result of the polyurethane manufacture process. Some of the waste from the process will be disposed of to landfill where it is likely to be mobile (log K_{oc} <-0.54). In any waste foam the notified chemical will be bound in polyurethane matrix and therefore will be immobile. The notified chemical will be persistent due to its low ready biodegradability. When incinerated oxides of nitrogen and carbon and some ammonia, possibly, will be emitted. Some of the waste from the process will be discharged to sewer. In STPs it is not likely that the notified chemical will partition to sludge. As the foam will be produced in localised area, a localised scenario was used to estimate the PEC.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	5,000	kg/year
Proportion expected to be released to sewer	3.200%	
Annual quantity of chemical released to sewer	160.000	kg/year
Days per year where release occurs	365	days/year
Daily chemical release:	0.438	kg/day
Individual Sewage Treatment Plant Average Daily Flow:	358.000	ML/day
Removal within STP	0%	
Dilution Factor - River	1.0	
Dilution Factor - Ocean	10.0	
PEC - River:	1.22	µg/L
PEC - Ocean:	0.12	µg/L

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 C.

Endpoint	*Result*	*Assessment Conclusion*
Fish Toxicity	96 h LC50 >100 mg/L	Slightly toxic to fish.
Daphnia Toxicity	48 h EC50 >100 mg/L	Slightly toxic to Daphnia.

Algal Toxicity	72 h ErC50 >100 mg/L 72 h EbC50 = 64 mg/L	Slightly toxic to algae.
Inhibition of Bacterial Respiration	EC50 >100 mg/L	Slightly toxic to microbial activity.

7.2.1 Predicted No-Effect Concentration

The predicted no effect concentration (PNEC) of the notified chemical is calculated by dividing the lowest ecotoxicity endpoint by a safety factor depending on the number of trophic levels for which there is data.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (Alga).	64.00	mg/L
Assessment Factor	100.00	
Mitigation Factor	1.00	
PNEC:	640.00	µg/L

7.3. Environmental risk assessment

The Risk Quotient (Q) is determined by dividing the PEC by the PNEC (both calculated above)

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River:	1.22	640	0.002
Q - Ocean:	0.12	640	0.000

Since the calculated Q value is less than 1 there is not a risk to the aquatic compartment associated with the use of the notified chemical as specified in this assessment.

8. CONCLUSIONS – SUMMARY OF RISK ASSESSMENT FOR THE ENVIRONMENT AND HUMAN HEALTH

8.1. Hazard classification

Based on the available data the notified chemical is classified as hazardous under the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)]. The classification and labelling details are:

R22 Harmful if swallowed
R34 Causes burns
R43 May cause sensitisation by skin contact

and

As a comparison only, the classification of the notified chemical using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations, 2003) is presented below. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

	Hazard category	***Hazard statement***
Acute oral toxicity	4	Harmful if swallowed
Skin irritation/corrosion	1B	Causes severe skin burns and eye damage
Skin sensitisation	1	May cause an allergic skin reaction

8.2. Human health risk assessment

8.2.1. Occupational health and safety

Under the conditions of the occupational settings described, the risk to workers is considered to be acceptable.

8.2.2. Public health

When used in the proposed manner the risk to the public is considered to be acceptable.

8.3. Environmental risk assessment

On the basis of the PEC/PNEC ratio:

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

9. MATERIAL SAFETY DATA SHEET

The MSDS of the notified chemical provided by the notifier was reviewed by NICNAS and is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant. The MSDS was found to be in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 2003).

10. RECOMMENDATIONS

REGULATORY CONTROLS

Hazard Classification and Labelling

- The Office of the ASCC, Department of Employment and Workplace Relations (DEWR), should consider the following health hazard classification for the notified chemical:
  - R22 Harmful if swallowed
  - R34 Causes burns
  - R43 May cause sensitisation by skin contact

- Use the following risk phrases for products/mixtures containing the notified chemical:
  - ≥25% R22, R34, R43
  - ≥ 10%: R34, R43
  - ≥ 5%, < 10%: R36, R38, R43
  - ≥ 1%: R43.

- The notified chemical should be classified as follows under the ADG Code:
  - Class 8 (Corrosive)

Health Surveillance

- As the notified chemical is a skin sensitiser, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a significant risk of sensitisation.

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified chemical as introduced:
  - Automated chemical transfer apparatus.
  - Exhaust ventilation during polyurethane foam manufacture.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified chemical as introduced:
  - Procedures designed to minimise spillage during transfer operations together with adequate clean up and disposal.

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical as introduced:
  - Gloves, goggles or faceshield and workwear impervious to the notified chemical

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

- A copy of the MSDS should be easily accessible to employees.

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)], workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The following control measures should be implemented by foam manufacturer to minimise environmental exposure during use of the notified chemical:
  - Do not allow the chemical to enter any stormwater drains or natural water bodies.

Disposal

- The notified chemical should be disposed of to landfill or, if available, by incineration.

Emergency procedures

- Spills or accidental release of the notified chemical should be handled by containment, collected by an appropriate absorbent, placed in a labelled and sealable container ready for disposal.

11. REGULATORY OBLIGATIONS

This risk assessment is based on the information available at the time of notification. If the circumstances under which the notified chemical was assessed change a reassessment may be needed. Under 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 polyurethane manufacture, or is likely to change significantly;
- the amount of chemical being introduced has increased to more than 5 tonnes per annum, or is likely to increase, significantly;
- if 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.

APPENDIX A: PHYSICO-CHEMICAL PROPERTIES

All physical and chemical properties were tested using >95% pure notified chemical.

Melting Point/Freezing Point < -76°C

METHOD OECD TG 102 Melting Point/Melting Range.
EC Directive 92/69/EEC A.1 Melting/Freezing Temperature.

Remarks During the preliminary screening test it was found that the notified chemical has no defined freezing point or freezing range. The viscosity increased with decreasing temperature, without showing a clear phase transition of liquid into the solid state. At -82.1 to -76.3°C the notified chemical was a clear viscous liquid.

TEST FACILITY NOTOX B.V. (2005a)

Boiling Point 270°C at 100.7 kPa

METHOD OECD TG 103 Boiling Point.
EC Directive 92/69/EEC A.2 Boiling Temperature.

Remarks The boiling point of the notified chemical was found to be 270°C, using differential scanning calorimetry. The atmospheric pressure during the performance of the test was 100.7 kPa.

TEST FACILITY NOTOX B.V. (2005b)

Density 905 kg/m^3 at 20.0°C

METHOD OECD TG 109 Density of Liquids and Solids.
EC Directive 92/69/EEC A.3 Relative Density.

Remarks A glass pycnometer with a nominal volume of 10 mL was used. The temperature of the measurement was 20°C.

TEST FACILITY NOTOX B.V. (2005c)

Vapour Pressure 0.0047 kPa at 20°C

METHOD OECD TG 104 Vapour Pressure.
EC Directive 92/69/EEC A.4 Vapour Pressure.

Remarks Determined using the static technique with a capacitance manometer.

TEST FACILITY NOTOX B.V. (2005d)

Water Solubility >978 g/L at 20°C

METHOD OECD TG 105 Water Solubility.
EC Directive 92/69/EEC A.6 Water Solubility.

Remarks Flask Method with analysis by visual inspection.
A mixture of 508.3 mg notified chemical and 519.7 mg (0.5197 mL) double distilled water was stirred for 4 days at 20.2°C±0.5°C. After the stirring period, a clear light yellow solution without any undissolved test substance was observed visually. Based on this it was concluded that the water solubility of the notified chemical was > 978 g/L at 20.2±0.5°C. The pH was measured to be 12.3.

TEST FACILITY NOTOX B.V. (2005e)

Hydrolysis as a Function of pH The notified chemical is hydrolytically stable.

METHOD OECD TG 111 Hydrolysis as a Function of pH.

pH	*T (°C)*	*$t_{½}$ days*
4	50.1±0.1	>365
7	50.1±0.1	>365
9	50.1±0.1	>365

Remarks At pH 4, 7 and 9 less than a 10% decrease in concentration was observed after 5

days (half life time at 25ºC greater than 1 year) and 10 days of incubation.
TEST FACILITY NOTOX B.V.(2005f)

Partition Coefficient (n-octanol/water) log P_{ow} at 20ºC = <-3.0

METHOD OECD 107 Partition Coefficient (n-octanol/water): Estimation method
EC Directive 92/69/EEC A.8 Partition Coefficient.
Remarks The estimation method was used. The estimation method is recognised by the international guidelines and estimates the partition coefficient from the quotient of the n-octanol solubility and the water solubility.

The HPLC method was not used as the test substance did not display the required reversed-phase behaviour and the calculated Pow was outside the applicability range for this method. While use of the shaking flask method would have required concentrated buffers at extreme pH, which had no relevance for the environment. Furthermore the analytical methods available incapable of determining the expected low concentrations of the test substance in the octanol phase.

The solubility of the test substance in n-octanol water is <1.0 g/L and was determined as part of this study. A previously determined water solubility of >978 g/L was used.

The partition coefficient (n-octanol/water), Pow, calculated as a quotient of the n-octanol solubility and water solubility of the notified chemical is <1.0 x 10^{-3} (log Pow <-3.0)
TEST FACILITY NOTOX B.V. (2005g)

Partition Coefficient (n-octanol/water) log P_{ow} at 22ºC <0.3 (at pH 5.5)
log P_{ow} at 22ºC =1.0 (at pH 11)

METHOD OECD TG 117 Partition Coefficient (n-octanol/water), HPLC Method.
EC Directive 92/69/EEC A.8 Partition Coefficient.
Remarks Analytical Method:
UV at pH 5.5: 210nm and 225nm
UV at pH 11: 210nm and 236nm
MS: Scan, 50-1000 amu

Impurities with peak area >1% of the total peak
pH 5.5: log Pow =0.8
pH 11: no impurities with a peak area >1% of the total peak were observed.

At pH 5.5, >90% of the notified chemical is in its ionised form
At pH 11, >90% of the notified chemical is in its non ionised form.
TEST FACILITY NOTOX B.V.(2006a)

Surface Tension 70.3 mN/m at 20.0ºC

METHOD OECD TG 115 Surface Tension of Aqueous Solutions.
EC Directive 92/69/EEC A.5 Surface Tension.
Remarks Concentration: 1.01g/L
Based on the criteria outlined in EEC guidelines the notified chemical is not surface active.
TEST FACILITY NOTOX B.V. (2005h)

Adsorption/Desorption log K_{oc} <-0.54
– screening test (calculated)

METHOD QSAR given in the technical guidance document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances and Commission Regulation (EC) 1488/94 Risk Assessment for existing substances.

REMARKS Due to the nature of the notified chemical it was not possible to determine the Koc of the notified chemical experimentally. Based on the water solubility and molecular formula of the notified chemical, it was classified as non-hydrophobic and the log Koc calculated using the equation:

log Koc =0.52 log Pow +1.02

Using the partition coefficient, log Pow <-3.0, and the above equation the log Koc was calculated to be <-0.54. Therefore, the notified chemical will be mobile in soil and sediments.

TEST FACILITY NOTOX B.V. (2005i)

Dissociation Constant pKa = 7.5, 8.9, 9.9 (calculated)

METHOD OECD TG 112 Dissociation Constants in Water.

Remarks It was not possible to determine the pKa values experimentally using the titration method. As an alternative, the pKa were calculated using pKalc version 5.0 computer program. The calculated pKa values were:

Acidic groups

None

Basic groups

Group 1	9.9
Group 2	8.9
Group 3	7.5

TEST FACILITY NOTOX B.V. (2005j)

Flash Point 124ºC at 101.7 kPa

METHOD EC Directive 92/69/EEC A.9 Flash Point.

Remarks A Pensky-Martens Closed Cup automatic flash-point tester was used.

TEST FACILITY NOTOX B.V. (2005k)

Flammability Does not develop dangerous amounts of flammable gas on contact with water.

METHOD EC Directive 92/69/EEC A.12 Flammability (Contact with Water).

Remarks Based on its molecular structure and the results of one experiment it was concluded that the notified is incapable of developing a dangerous amount of flammable gas on contact with damp air or water.

TEST FACILITY NOTOX B.V. (2005l)

Autoignition Temperature 205ºC

METHOD 92/69/EEC A.15 Auto-Ignition Temperature (Liquids and Gases).

Remarks The lowest measured auto ignition temperature was 208ºC at an injection volume of 70 µl. In accordance with DIN51794 "Bestimmug der zundtempatur" (1978) the temperature was rounded down to the nearest 5ºC.

TEST FACILITY NOTOX B.V. (2005m)

Pyrophoric properties None

METHOD EC Directive 92/69 EEC A.13 Pyrophoric Properties of Solids and Liquids.

Remarks Based on the composition and the structure of the notified chemical and based on handling experience it was concluded that the notified chemical is not pyrophoric.

TEST FACILITY NOTOX B.V. (2005n)

Explosive Properties Not predicted to be explosive.

METHOD EC Directive 92/69/EEC A.14 Explosive Properties.

Remarks The molecular structure of the notified chemical does not contain any chemically

	unstable or highly energetic groups that might lead to an explosion. The notified chemical has an oxygen balance <-200% and therefore is considered not explosive.
TEST FACILITY	NOTOX B.V. (2005o)

Oxidising Properties None

METHOD	EC Directive 2004/73/EC A.21 Oxidising Properties (Liquid).
Remarks	Based on the composition and the molecular structure of the notified chemical it was concluded that the notified chemical has no oxidising properties.
TEST FACILITY	NOTOX B.V. (2005p)

APPENDIX B: TOXICOLOGICAL INVESTIGATIONS

7.1. Acute toxicity – oral

TEST SUBSTANCE	Notified chemical (purity >92%)
METHOD	OECD TG 423 Acute Oral Toxicity – Acute Toxic Class Method. EC Directive 92/69/EEC B.1tris Acute Oral Toxicity – Acute Toxic Class Method. US EPA, OPPTS 870.1100 (2002), Acute Oral Toxicity – Acute Toxic Class Method. JMAFF Guidelines (2000).
Species/Strain	Rat/Wistar strain Crl:Wl
Vehicle	Water (Milli-U)
Remarks – Method	The notified chemical was administered by oral gavage to three female Wistar rats at 300 mg/kg bw. In a stepwise procedure additional groups of females were dosed at 300 and 2000 mg/kg bw. All animals were subjected to daily observations and weekly determination of body weight. Macroscopic examination was performed on the day of death or after terminal sacrifice at day 15.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	3/females	300	0/3
II	3/females	300	0/3
III	3/females	2000	2/3

LD50	1000 mg/kg bw
Signs of Toxicity	Two females dosed at 2000 mg/kg bw were found dead on days 2 or 4. No further mortality occurred. Hunched posture and uncoordinated movements were observed in animals treated at 300 mg/kg bw Lethargy, hunched posture, uncoordinated movements, ptosis, piloerection and chromodacryorrhoea were observed in animals dosed at 2000 mg/kg bw. Body weight gain observed in the surviving animals over the study period was considered to be similar to that expected of normal untreated animals of the same age and strain.
Effects in Organs	Macroscopic examination of the animals that died following dosing at 2000 mg/kg bw revealed abnormalities of the stomach which included a dark red discolouration, thickening of the glandular mucosa and an irregular surface of glandular mucosa. No abnormalities were observed at the macroscopic post mortem examination of the surviving animals.
Remarks – Results	The oral LD50 value of the notified chemical in Wistar rats was found to be within the 300-2000 mg/kg bw range. In accordance with the OECD 423 test guidelines the LD50 cut off value was considered to be 1000 mg/kg bw.
CONCLUSION	The notified chemical is harmful via the oral route.
TEST FACILITY	NOTOX B.V. (2005q)

7.2. Acute toxicity – dermal

Remarks – Results	The study was not conducted due to the likelihood of severe irritation or corrosion as shown in the submitted primary skin irritation study and the potential for skin irritation to affect dermal absorption.

7.3. Acute toxicity – inhalation

Not conducted

7.4. Irritation – skin

TEST SUBSTANCE	Notified chemical (purity >92%)
METHOD	OECD TG 404 Acute Dermal Irritation/Corrosion. EC Directive 92/69/EEC B.4 Acute Toxicity (Skin Irritation). US EPA, OPPTS 870.2500 (1998), Acute Dermal Irritation. JMFF Guidelines (2000).
Species/Strain	Rabbit/New Zealand White
Number of Animals	One
Vehicle	The notified chemical was applied undiluted as provided.
Observation Period	Nil.
Type of Dressing	Semi-occlusive.
Remarks – Method	All available data relevant to potential dermal irritation/corrosivity of the notified chemical were considered prior to commencing the test. Based on the available data severe effects were expected. Alternative *in vitro* methods were considered, but at the time there were no *in vitro* methods that would permit packaging assignment of the notified chemical. To reduce the risk of animal harm, the study commenced with one animal treated in a stepwise manner with three patches. The animal received 0.5mL of the notified chemical to intact, clipped skin of one flank using a 2 x 3 cm metalline patch. The patch was mounted on Micropore tape which was wrapped around the abdomen and secured with Coban elastic bandage.
RESULTS	
Remarks – Results	The dressing was removed 3 minutes after the first application. Since no signs of severe skin reactions were observed (erythema score of 1) and it was considered that exposure could continue humanely, two 0.5 mL samples of the notified chemical were applied to two separate intact, clipped skin site on the same animal. At one hour the bandage was removed from application site. Since severe erythema (Draize score 4) and signs of necrosis were observed after one hour of exposure, the remaining sample and dressing were removed immediately. After the skin reading the study was terminated and the animal was sacrificed.
CONCLUSION	The notified chemical is corrosive to skin.
TEST FACILITY	NOTOX B.V. (2005r)

7.5. Irritation – eye

Remarks – Results	The study was not conducted due to the likelihood of severe irritation or corrosion as shown in the submitted primary skin irritation study.

7.6. Skin sensitisation – mouse local lymph node assay (LLNA)

TEST SUBSTANCE	Notified chemical (>92% purity)
METHOD	OECD 429 Skin Sensitisation: Local Lymph Node Assay EC Commission Directive 2004/73/EC, B.42 Skin sensitisation: Local Lymph Node Assay (2002). US EPA, OPPTS 870.2600, Skin sensitisation.
Species/Strain	Mouse/CBA
Vehicle	Acetone/Olive oil (4:1 v/v)
Remarks – Method	No significant protocol deviation

RESULTS

Concentration	*Proliferative response (DPM/lymph node)*	*Stimulation Index (Test/Control Ratio)*
Test Substance		
2.5%	2450 ± 740	4.8 ± 0.5
5.0%	7969 ± 4406	15.6 ± 0.6
10%	10609 ± 958	20.8 ± 0.7
Positive Control		
5%	235 ± 53	1.0 ± 0.4
10%	766 ± 225	3.2 ± 0.4
25%	1708 ± 509	7.1 ± 0.4

Remarks – Results	No mortality occurred and no signs of systemic toxicity were observed in the animals of the main study. All nodes of the animals treated at 5% and the majority of nodes from the animals treated at 10% were enlarged in size. No other macroscopic abnormalities of the nodes were noted. Body weights and body weight gains of the experimental animals remained in the same range as controls over the study period. Slight body weight loss, noted in some animals was not considered of toxicological significance. The sensitivity and reliability of the test system was confirmed by a periodic check of the a positive control α-hexylcinnamic aldehyde.
CONCLUSION	There was evidence of induction of a lymphocyte proliferative response indicative of skin sensitisation to the notified chemical.
TEST FACILITY	NOTOX B.V. (2005s)

7.7. Repeat dose toxicity

TEST SUBSTANCE	Notified chemical (>92%)
METHOD	OECD TG 407 Repeated Dose 28-day Oral Toxicity Study in Rodents. EC Directive 96/54/EC B.7 Repeated Dose (28 Days) Toxicity (Oral). US EPA, OPPTS 870.3050, Repeated Dose 28-Day Oral Toxicity Study in Rodents.

	Japanese Chemical Substances Control Law 1987, Notification of Nov. 21 2003 by MHLW (No. 1121002), METI (No. 2) and ME (No. 031121002).
Species/Strain	Rat: Wistar :Crl (Wl) BR
Route of Administration	Oral – gavage
Exposure Information	Total exposure days: 28 days; Dose regimen: 7 days per week; Post-exposure observation period: 14 days
Vehicle	Water (Milli-U)
Remarks – Method	No significant deviations in protocol.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw/day*	*Mortality*
I (control)	5/sex	0	0/10
II (low dose)	5/sex	50	0/10
III (mid dose)	5/sex	150	0/10
IV (high dose)	5/sex	1000	7/10
V (control recovery)	5/sex	0	0/10
VI (high dose recovery)	5/sex	1000	0/10

Mortality and Time to Death

All rats in the 0, 50, or 150 mg/kg bw/day groups survived the scheduled duration of the study.

At 1000 mg/kg bw/day 3 males and 7 females died or were killed in a moribund state in the course of treatment. Seven deaths (two males, five females) at 1000 mg/kg bw/day occurred in during the first weeks of the study, while the remaining three deaths (one male, two females) occurred in week four of the treatment. Misgavage in two animals and inanition in a third were considered factors that contributed to death or moribundity.

Clinical Observations

Clinical signs

The clinical signs observed in one control male and test animals at 50 and 150 mg/kg bw/day were considered not to be treatment related.

At 1000 mg/kg bw/day all males and females showed brown discolouration of urine by the end of week 1 up to the end of treatment. Diarrhoea was observed in 2 males and 3 females during the first week of treatment. Salivation was observed in the 5 males and 5 females during the treatment phase. Squeaking was observed in 4 males and piloerection and/or a hunched posture were observed in 4 females, many of which subsequently died or were killed in a moribund state. Squeaking, rales and ptosis in males and lethargy, tremor, gasping, pale appearance, ptosis, hunched posture and swelling of the abdomen in the females were noted prior to unscheduled deaths.

Functional observations.

Hearing ability, pupillary reflex, static righting reflex, and grip strength were normal in all animals. At 1000 mg/kg bw/day a statistically significant difference was observed in the motor activity assessment with the lower stressors. After recovery, the motor activity assessment indicated no difference in activity between the high dose and the control animals.

Ophthalmoscopic examination

There were no treatment related ophthalmoscopic findings at week four. One male dosed at 150 mg/kg bw/day had focal corneal opacity in the right eye. In the absence of ophthalmoscopic observations in any of the other animals in the study, this finding was considered to have occurred by chance and to be of no toxicological significance.

Body weight

Body weight gains in the low and mid dose groups were similar to the control group. The surviving males and females at 1000 mg/kg bw/day showed slightly reduced weight gains relative to controls by the end of the

treatment period, which was attributed to the reduced weight gains in week 4. Males at 1000 mg/kg bw/day showed higher weight gains than controls during the first week of the recovery period. During the recovery phase weight gains of the high dose females were similar to the female controls and hence the body weights remained lower than the control females.

Food consumption
Food consumption and relative food consumption in the low and mid dose groups were similar to those of the control animals. Animals in the high dose group ate less food in treatment weeks 1 and 4, this effect was more marked in females than in males. During the recovery period, food consumption and relative food consumption were similar for both treatment and control animals.

Laboratory Findings – Clinical Chemistry, Haematology, Urinalysis
Haematology
The following deviations from control means were noted in surviving males at 1000 mg/kg bw/day at the end of the treatment phase and were considered treatment related:

- Lower proportion total lymphocyte counts, associated with a higher proportion of neutrophils and monocytes; band neutrophils were observed in one male. No such deviations were seen at the end of the recovery period, which would indicate these effects were reversible.

The following statistically significant deviations from controls after treatment or recovery phase were considered incidental:

- Lower prothrombin times were recorded in all groups of treated males and the high dose females at the end of the treatment times. The deviation were considered to be within the range of normal biological variation and therefore not of biological significance.
- Partial thromboplastin time lower in males at 1000 mg/kg bw/day at the end of the recovery phase. A similar effect was not seen after the treatment phase and this deviation was not considered treatment related.
- Lower total leukocytes counts were recorded for females at 50 mg/kg bw/day at the end of the treatment phase. Similar changes were not observed at the higher dose levels and this deviation was not considered treatment related.
- A higher haemocrit and red cell distribution width, and a lower mean cell haemoglobin concentration were recorded for the surviving high dose female at the end of the recovery phase. Similar changes were not seen after the treatment phase and these deviations were therefore not considered treatment related.

Clinical biochemistry
The following statistically significant deviations from the control mean noted at the end of the treatment phase were considered to be treatment related:

- Lower levels of glucose in males at 1000 mg/kg bw/day and lower levels of total protein and albumin in males and females at 1000 mg/kg bw/day, and lower total protein levels in females at 150 and 50 mg/kg bw/day.

The lower total protein and albumin levels were not reversed completely at the end of the recovery period in high dose males suggesting that these changes are persistent.
The following statistically significant deviations from controls after treatment or recovery phase were considered to be incidental:

- Higher bilirubin values were recorded for males at 50 mg/kg bw/day at the end of the treatment phase. Similar changes were not seen in higher dose animals and therefore this change was not considered treatment related.
- Higher urea and chloride values were recorded for high dose males at the end of the recovery period. Similar changes were not seen after the treatment phase and these deviations were there not considered to be related to treatment.
- Alanine aminotransferase activity was higher and aspartate aminotransferase activity was lower for the surviving high dose females at the end of the recovery phase. Similar changes were not seen after the treatment phase and these deviations were therefore not considered related to treatment.

Effects in Organs
Macroscopic Examination
There were treatment related gross findings in the stomach at 1000 mg/kg bw/day.

Most of the macroscopic findings in the unscheduled deaths could be attributed to post mortem effects. One female at 1000 mg/kg bw/day had a thickened limiting ridge in the stomach.

In the terminal sacrifices, a statistically significant increased incidence of foci and/or thickened limiting ridge in the stomach were recorded for males and a non statistically significant occurrence in one female at 1000 mg/kg bw/day. In a further two males and one female there were non statistically significant incidences of an irregular forestomach surface at 1000 mg/kg bw/day.

The remainder of the recorded macroscopic findings in both the treatment or recovery allocations at terminal sacrifice were considered to be spontaneous in nature.

Organ weight
The following statistically significant deviations were noted at 1000 mg/kg bw/day at the end of treatment and were attributed to differences in terminal body weights: lower absolute epididymides weights and higher relative brain, liver, kidneys and testes weights in males at the after treatment and in females a higher relative spleen and brain weight after treatment and a higher relative adrenal weight after recovery.

Microscopic Examination
Treatment related microscopic findings were found in stomach, liver and spleen at 1000 mg/kg bw/day.

In the unscheduled deaths, glandular epithelial erosion in the stomach was noted in one male at 1000 mg/kg bw/day while one female at 1000 mg/kg bw/day had forestomach squamous hyperplasia. In the liver, centrilobular macrovesicular vacuolation was recorded in one male at 1000 mg/kg bw/day and one female of this group had coagulative necrosis of the liver. Red pulp atrophy of the spleen was noted in two females and lymphoid atrophy was seen in three females at 1000 mg/kg bw/day.

In the terminal sacrifices, ulceration of the forestomach was seen in three males at 1000 mg/kg bw/day and forestomach squamous hyperplasia was noted in four males and two females at 1000 mg/kg bw/day. These histological findings correlated with the macroscopic observations of the stomach at necroscopy. Glandular inflammation was observed in three males at 1000 mg/kg bw/day. In the liver, centrilobular macrovesicular vacuolation was observed in four males at 1000 mg/kg bw/day and microgranuloma was seen in four males and two females at 1000 mg/kg bw/day.

After recovery, forestomach squamous hyperplasia was still detected in one high dose female.

The remainder of the microscopic findings recorded were within the range of background pathology encountered in Wistar rats of the age and strain used in this study and occurred at similar incidences and severity in both control and treated rats.

Remarks – Results
Mortality, morphological alteration in the stomach, liver and spleen were observed at 1000 mg/kg bw/day. No signs of toxicity were observed at 50 and 150 mg/kg bw/day.

Findings observed in the motor activity assessment of males dosed at 1000 mg/kg bw/day suggest that the animals were more stationary in the cages and this may be related to the discomfort observed during clinical observations. Although this finding is considered related to treatment there are no corroborative histopathological or clinical pathological findings that would suggest that notified chemical caused neural dysfunction.

The macroscopic and microscopic alterations observed in the stomach and forestomach at 1000 mg/kg bw/day were considered due to local irritation caused by the notified chemical and not related to systemic toxicity. The centrilobular macrovesicular vacuolation and microgranuloma found in the liver at 1000 mg/kg bw/day were considered systemic.

The observed shift in the type of white blood cells (reduced lymphocytes with neutrophilia) might be a secondary non specific response to stress associated with treatment. Therefore, the change in white blood cells may be considered not to be primary toxicological significance.

The persisting lower protein and albumin levels in the recovery animals suggest that there is an irreversible alteration in the protein synthesis in the treated animals. While similar changes in the low and mid dose animals were not corroborated with other findings which suggest adversely altered protein metabolism or related liver dysfunction. Therefore the effect is considered to be of no toxicological significance.

CONCLUSION
The No Observed (Adverse) Effect Level (NO(A)EL) was established as 150 mg/kg bw/day in this study, based on the mortality and morphological alterations in the stomach, liver and spleen at the higher dose.

TEST FACILITY NOTOX B.V. (2005t)

7.8. Genotoxicity – bacteria

TEST SUBSTANCE Notified chemicals (>98.2% purity)

METHOD OECD TG 471 Bacterial Reverse Mutation Test.
EC Directive 2000/32/EC B.13/14 Mutagenicity – Reverse Mutation Test using Bacteria.
Guideline stipulated by the Japanese Ministry of Health, Labour and Welfare, Ministry of Economy, Trade and Industry and Ministry of the Environment (revised April 30, 2004).
Plate incorporation procedure

Species/Strain	*S. typhimurium*: TA1535, TA1537, TA98, TA100, *E. coli*: WP_2 *uvr*A
Metabolic Activation System	S9 fraction from phenobarbital /β-naphthoflavone induced rat livers
Concentration Range in Main Test	a) With metabolic activation: 0-5000 µg/plate. b) Without metabolic activation: 0-5000µg/plate.
Vehicle	Milli-Q water
Remarks – Method	No significant protocol deviation.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/plate) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Present Test 1 Test 2	>5000	>5000	>5000	Negative
Absent Test 1 Test 2	>5000	>5000	>5000	Negative

Remarks – Results All bacterial strains showed a negative response over the entire dose range.

The negative and strain specific positive control values were within the laboratory's background historical control data ranges indicating that the test conditions were adequate and the metabolic activation system functioned properly.

CONCLUSION The notified chemical was not mutagenic to bacteria under the conditions of the test.

TEST FACILITY NOTOX B.V. (2005u)

7.9. Genotoxicity – in vitro

TEST SUBSTANCE Notified chemical (>98.2% purity)

METHOD OECD TG 473 *In vitro* Mammalian Chromosomal Aberration Test.
EC Directive 2000/32/EC B.10 Mutagenicity - *In vitro* Mammalian

	Chromosome Aberration Test Guideline stipulated by the Japanese Ministry of Health, Labour and Welfare, Ministry of Economy, Trade and Industry and Ministry of the Environment (revised April 30, 2004).
Cell Type/Cell Line	Cultured peripheral human lymphocytes
Metabolic Activation System	S9 fraction from phenobarbital /β-naphthoflavone induced rat liver
Vehicle	RPMI 1640 medium
Remarks – Method	No significant deviation in protocol

Metabolic Activation	*Test Substance Concentration (μg/mL)*	*Exposure Period*	*Harvest Time*
Present			
Test 1	925*, 950, 975*, 1000, 1015*, 1025, 1035, 1050, 1065, 1075, 1100, 1150, 1200	3hr	24hr
Test 2	1000*, 1040*, 1060, 1080*, 1100, 1120, 1140, 1160, 1200	3hr	48hr
Absent			
Test 1	700, 800*, 850*, 900, 925*, 950, 975, 1000	3hr	24hr
Test 2	600, 700, 750, 800, 810*, 820, 830, 840*, 850*, 860, 870, 880, 900	24hr	24hr
Test 2	500*, 700*, 800*, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000	48hr	48hr

*Cultures selected for metaphase analysis.

RESULTS

Metabolic Activation	*Test Substance Concentration (μg/mL) Resulting in:*			
	Cytotoxicity in PreliminaryTest	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Present				
Test 1	>333	>1000	>1200	Negative
Test 2	>333	>1080	>1200	Negative
Absent				
Test 1	>333	>900	>1000	Negative
Test 2	>333	>850	>900	Negative
Test 2	>333	>700	>1000	Negative

Remarks – Results

In the first cytogenetic assay and in the second cytogenetic assay at the 24-hour exposure time the notified chemical did not induce a statistically significant or biologically relevant increase in the number of cells with chromosome aberrations in the absence or presence of S9 mix.

In the second cytogenetic assay at the 48-hour continuous exposure time in the absence of S9 mix and in the presence of S9 mix the notified chemical induced a statistically significant increase in the number of cells with chromosome aberrations at the highest, cytotoxic concentration only, both when gaps were included or excluded. Since the type of aberrations observed were mainly breaks and gaps, the increases were not demonstrated to be dose related and the number of cells with chromosome aberrations were at or just above the historical range, the increases were of limited biological relevance.

It was noted that the notified chemical increased the number of polypoid cells and the cells with endoreduplicated chromosomes both in the absence and presence of S9 mix in the first cytogenetic assay and in the presence of S9 mix in the second cytogenetic assay. This may indicate that the notified chemical has the potential to disturb mitotic processes and cell cycle progression.

CONCLUSION	The notified chemical exhibited equivocal clastogenicity to cultured peripheral human lymphocytes treated in vitro under the conditions of the test. The notified chemical has the potential to disturb mitotic processes and cell cycle progression.
TEST FACILITY	NOTOX B.V. (2005v)

APPENDIX C: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

ENVIRONMENTAL FATE

C.1.1. Ready biodegradability

TEST SUBSTANCE	Notified chemical (> 98% purity)
METHOD	OECD TG 301 B Ready Biodegradability: CO2 Evolution Test. EC Directive 92/69/EEC C.4-C Biodegradation: Determination of the " Ready" Biodegradability: Carbon Dioxide Evolution Test
Inoculum	Activated sludge freshly obtained from a municipal sewage treatment plant in 's-Hertogenbosch, The Netherlands
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Carbon dioxide/barium carbonate reaction to form barium hydroxide, followed by titration with 0.05M standardised hydrochloric acid.
Remarks – Method	No significant deviations in protocol. Reference substance - sodium acetate. Treatments: - 2 blank controls - 2 test bottles (20.5 mg/L test substance) - 1 positive control (40 mg/L reference substance) - 1 toxicity control (20.5 mg/L test substance plus 40 mg/L reference substance).

RESULTS

Notified chemical		*Sodium acetate*	
Day	*% degradation*	*Day*	*% degradation*
0	0	0	0
2	0	2	4
5	1	5	32
7	1	7	47
9	1	9	56
14	2	14	70
19	3	19	76
23	3	23	79
27	6	27	79
29	6	29	79
29	6	29	79
29	6	29	80

Remarks – Results

The theoretical CO_2 production of the notified chemical was calculated to be 2.17 mg CO_2/mg. The notified chemical was tested in duplicate at 41 mg per 2 litres, corresponding to 12 mg TOC/l. The organic carbon content was based on the molecular formula.

The relative degradation values calculated from the measurements performed during the test period revealed no significant degradation of the notified chemical. In the toxicity control the notified chemical was found not inhibit microbial activity.

All criteria for acceptability of the test were met, therefore the test was considered to be valid.

CONCLUSION	The notified chemical cannot be classed as ready biodegradable.
TEST FACILITY	NOTOX B.V. (2005w)

C.1.2. Bioaccumulation

No bioaccumulation data is available for the notified chemical. However the bioaccumulation potential of the notified chemical is low due to its high water solubility and low log Pow.

Environment Canada/Health Canada undertook modelling of the environmental fate of the notified chemical in their assessment of the notified chemical, which is presented in the following table.

Environment Canada/Health Canada Supplementary Environmental Fate Data

Property	Value	Source*
Biodegradation		
Primary Survey	Weeks	EPI v. 3.12
Ultimate Survey	Weeks-months	EPI v. 3.12
Ready Biodegradation	No	EPI v. 3.12
Simulated OECD 301C MITI (I)	26.1% after 28d.	Catabol v. 5.09
Air Oxidation half-life	0.505 hrs	EPI v. 3.12
Water half-life	252d.	Based on 7% Biodegradation
Soil half-life	Estimated 252d.	Based on water half-life
Sediment half-life	Estimated 1 008d.	Based on water half-life
BCF	3.162	EPI v. 3.12

Soil and Sediment half-lives are extrapolated using the water half-life multiplied by 1 and 4 respectively. (Boethling, 2000).

ECOTOXICOLOGICAL INVESTIGATIONS

C.2.1. Acute toxicity to fish

TEST SUBSTANCE	Notified chemical (>98% purity)
METHOD	OECD TG 203 Fish, Acute Toxicity Test - static. EC Directive 92/69/EEC C.1 Acute Toxicity for Fish
Species	*Cyprinus carpo*
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	250 mg $CaCO_3$/L
Analytical Monitoring	HPLC-MS
Remarks – Method	A preliminary range finding test was done. The final test solutions ranged from clear and colourless to hazy. Analytical samples were taken at the start and end of the test. There was no deviations from the standard method.

RESULTS

Concentration mg/L		*Number of Fish*	*Mortality*				
Nominal	*Actual*		*3½ h*	*24 h*	*48 h*	*72 h*	*96 h*
0	0	7	0	0	0	0	0
100	100	7	0	0	0	0	0

LC50	>100 mg/L at 96 hours.
NOEC	100 mg/L at 96 hours.
Remarks – Results	Analysis of the samples taken during the limit test showed that the measured concentration was in agreement with nominal and remained stable throughout the test. An increase in test concentration as observed in the range-finding test, was not observed in the limit test. The responses recorded in the limit test were in agreement with the range finding test. No fish died and no clinical effects were observed. Undissolved material in the form of precipitate was observed at 100 mg/L from 3½ hours onwards. Since the test solution was hazy at the

start of the test, the undissolved material was considered to originate from the test substance, even though it was not demonstrated by a decrease in test concentration. As the measured concentrations were based on quantification of the largest peak in the HPLC chromatogram, the precipitate may have originated from a part of the test substance that was not covered by the analytical method.

The test validity criteria were met.

CONCLUSION The notified chemical is very slightly toxic to *Cyprinus carpio* (carp).

TEST FACILITY NOTOX B.V. (2005x)

C.2.2. Acute toxicity to aquatic invertebrates

TEST SUBSTANCE Notified chemical (>98% purity)

METHOD OECD TG 202 Daphnia sp. Acute Immobilisation Test and Reproduction Test – static.
EC Directive 92/69/EEC C.2 Acute Toxicity for Daphnia

Species	*Daphnia magna*
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	250 mg $CaCO_3$/L
Analytical Monitoring	HPLC-MS
Remarks – Method	A preliminary range finding test was done. The final test solutions ranged from clear and colourless to hazy. Analytical samples were taken at the start and end of the test. No significant deviation from protocol.

RESULTS

Concentration mg/L		*Number of D. magna*	*Number Immobilised*	
Nominal	*Actual*		*24 h [acute]*	*48 h [acute]*
2.2	2.2	20	0	0
4.6	4.6	20	0	0
10	10	20	0	0
22	22	20	0	0
46	46	20	0	0
100	100	20	3	5

LC50	>100 mg/L at 48 hours *[acute]*
NOEC	46 mg/L at 48 hours *[acute]*
Remarks – Results	Analysis of the sample taken at the start of the final test showed that measured concentrations were in agreement with the nominal. During the exposure period the measured concentration remained constant, even though precipitate was observed in 100 mg/L solution after 48 hours. Therefore the results are based on the nominal concentration. During the final test, undissolved material was observed at the highest test concentration. Again, this solution was the only solution that was slightly hazy at the start of the test, and the undissolved material observed during the test was considered to originate from the test substance. This was however not indicated by the measured concentration, which was stable during the test. Since the measured concentration was based on quantification of the largest peak in the HPLC chromatogram, the observed precipitate may have been caused by a part of the test substance that was not covered by the analytical method.

As seen in the range-finding study, all immobile daphnids were covered by undissolved material. The mobile daphnids exposed to the highest test concentration did not have any undissolved material attached to their bodies or filter apparatus. Therefore, the observed immobilisation could be attributed to mechanical damage rather than to intrinsic toxicity of the test substance.

The test validity criteria were met.

CONCLUSION The notified chemical is very slightly toxic to *Daphnia magna*.

TEST FACILITY NOTOX BV (2005y)

C.2.3. Algal growth inhibition test

TEST SUBSTANCE Notified chemical (>98% purity)

METHOD OECD TG 201 Alga, Growth Inhibition Test.
EC Directive 92/69/EEC C.3 Algal Inhibition Test.

Species	*Selenastrum capricornutum*
Exposure Period	72 hours
Concentration Range Nominal	0-100 mg/L
Concentration Range Actual	1-100 mg/L
Auxiliary Solvent	None
Water Hardness	24 mg $CaCO_3$/L
Analytical Monitoring	None.
Remarks – Method	None.

RESULTS

Biomass		*Growth*	
E_bC_{50} *mg/L at 72 h*	*NOEC mg/L*	E_rC_{50} *mg/L at 72h*	*NOEC mg/L*
64 (35-120)	18	>100	32

Remarks – Results Two EC_{50} tests were conducted; the results presented here are the lower values of the two. In the first EC_{50} test algae were exposed to nominal concentrations of 10, 18, 32, 56, 100 mg/L. The total test period was 72 hours and samples for analysis were taken at the start and end of the test. Measured concentrations were in agreement with nominal throughout the test. Inhibition and growth rate reduction were lower than what was expected based on the range finding test. Therefore the EC_{50} test was repeated.

The second EC_{50} test was performed under the same conditions as first EC_{50} test. Measured concentrations were again in agreement with nominal throughout the test period. Inhibition and growth rate reduction were again lower that what was expected based on the range-finding test, but was in relatively close agreement with the results of the first EC_{50} test.

CONCLUSION Under the conditions of the study with *Selenastrum capricornutum* inhibition of biomass was recorded at 64 mg/L notified chemical.

TEST FACILITY NOTOX BV (2005z)

C.2.4. Inhibition of microbial activity

TEST SUBSTANCE	Notified chemical (>98% purity)
METHOD	OECD TG 209 Activated Sludge, Respiration Inhibition Test. EC Directive 88/302/EEC C.11 Biodegradation: Activated Sludge Respiration Inhibition Test.
Inoculum	Activated sludge freshly obtained from a municipal sewage treatment plant in 's-Hertogenbosch, The Netherlands
Exposure Period	0.5 hours
Concentration Range Nominal	100 mg/L
Remarks – Method	No significant deviation from protocol.
RESULTS	
IC50	>100 mg/L
NOEC	<100 mg/L
Remarks – Results	No significant inhibition of respiration rate of the sludge was recorded at 100 mg/L of the notified chemical. A duplicate measurement confirmed the result.
CONCLUSION	Under the conditions of the test, the notified chemical was not toxic to waste water (activated sludge) bacteria at a concentration of 100 mg/L
TEST FACILITY	NOTOX BV (2005aa)

BIBLIOGRAPHY

FORS (Federal Office of Road Safety) (1998) Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code), 6th Edition, Canberra, Australian Government Publishing Service

NOHSC (1994) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

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

NOHSC (2003) National Code of Practice for the Preparation of Material Safety Data Sheets, 2nd edition [NOHSC:2011(2003)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOTOX B.V. (2005a) Determination of the Freezing Point of the Notified Chemical (NOTOX Project Number 423506, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005b) Determination of the Boiling Temperature of the Notified Chemical by Differential Scanning Calorimetry (NOTOX Project Number 423517, 27 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005c) Determination of the Density (Liquid) of the Notified Chemical (NOTOX Project Number 423528, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005d) Determination of the Vapour Pressure of the Notified Chemical by the static method (NOTOX Project Number 423539, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005e) Determination of the water solubility of the Notified Chemical by the Static Method (NOTOX Project Number 423552, 18 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005f) Determination of Hydrolysis of the Notified Chemical as a Function of pH (NOTOX Project Number 423642, 18 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005g) Determination of the Partition Coefficient (n-octanol/water) of the Notified Chemical) (NOTOX Project Number 426563 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005h) Determination of the Surface Tension of an Aqueous Solution of the Notified Chemical. (NOTOX Project Number 423541 18 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V.(2005i) Estimation of the Adsorption Coefficient (Koc) of the Notified Chemical on Soil and on Sewage Sludge using High Performance Liquid Chromatography (NOTOX Project Number 423631, 18 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005j) Determination of the Dissociation Constant(s) of the Notified Chemical in Water (NOTOX Project Number 435623, 18 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005k) Determination of the Flash Point of the Notified Chemical (NOTOX Project Number 435574, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005l) Statement on the flammability (contact with water) (NOTOX Project Number 423585, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005m) Determination of the autoignition temperature (NOTOX Project Number 423585, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005n) Statement on the Pyrophoric Properties of the Notified Chemical (NOTOX Project Number 423596, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005o) Statement on the Explosive Properties of the Notified Chemical (NOTOX Project Number 423607, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005p) Statement on the Oxidising Properties of the Notified Chemical (NOTOX Project Number 423618, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005q) Assessment of Acute Oral Toxicity with the Notified Chemical in the Rat (Acute Toxic Class Method) (NOTOX Project Number 423653, 27 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005r) Primary Skin Irritation/Corrosion Study with the Notified Chemical in the Rabbit (Semi Occlusive Application) (NOTOX Project Number 423675, 27 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005s) Assessment of Contact Hypersensitivity to the Notified Chemical in the Mouse (Local Lymph Node Assay) (NOTOX Project Number 423697, 27 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005t) Repeated Dose 28 Day Oral Toxicity Study with the Notified Chemical by Oral Gavage in the Rat Followed by a 14 Day Recovery Period (NOTOX Project Number 423708, 22 July 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005u) Evaluation of the Mutagenic Activity of the Notified Chemical in *Salmonella typhimurium* Reverse Mutation Assay and *Escherichia coli* Reverse Mutation Assay (with Independent Repeat) (NOTOX Project Number 423721, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005v) Evaluation of the Ability of the Notified Chemical to induce Chromosome Aberrations in Cultured Peripheral Human Lymphocytes (with Repeat Experiment) (NOTOX Project Number 423732, 2 November 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005w) Determination of the Ready Biodegradability Carbon Dioxide (Co_2) Evolution Test (Modified Sturm Test) of the Notified Chemical (NOTOX Project Number 423776, 25 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005x) 96 hour Acute Toxicity Study in Carp with Notified Chemical (Static) (NOTOX Project Number 423754, 28 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005y) Acute Toxicity Study in *Daphnia magna* with Notified Chemical (Static) (NOTOX Project Number 423765, 28 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005z) Freshwater Algal Growth Inhibition Test with Notified Chemical (NOTOX Project Number 423743, 28 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2005aa) Activated Sludge Respiration Inhibition Test with Notified Chemical (Contact Time: 30 Minutes) (NOTOX Project Number 4237387 24 October 2005), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

NOTOX B.V. (2006a) Determination of the Partition Coefficient of the Notified Chemical at pH5.5 and 11 using the HPLC Method (NOTOX Project Number 467292, 25 August 2006), NOTOX B.V, 's-Hertogenbosch, The Netherlands (unpublished report submitted by the notifier).

United Nations (2003) Globally Harmonised System of Classification and Labelling of Chemicals (GHS). United Nations Economic Commission for Europe (UN/ECE), New York and Geneva.