File No: LTD/1969

May 2017

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Cyclohexanecarboxylic acid, 2,2,6-trimethyl-, 2-propen-1-yl ester, (1*R*,6*S*)-

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

This Public Report is 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

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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
LTD/1969	Takasago International (Singapore) Pte Ltd	Cyclohexanecarboxylic acid, 2,2,6-trimethyl-, 2-propen-1-yl ester, (1*R*,6*S*)-	Yes	< 1 tonne per annum	Fragrance ingredient

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 of Classification and Labelling of Chemicals* (GHS; United Nations, 2009), as adopted for industrial chemicals in Australia. The recommended hazard classification is presented in the following table.

Hazard classification	*Hazard statement*
Skin Sensitiser Category 1B	H317 – May cause an allergic skin reaction

The environmental hazard classification according to the 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 2)	H401 – Toxic to aquatic life
Chronic (Category 2)	H411 – 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 reported 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:
  - Skin Sensitiser (Category 1B): H317 – May cause an allergic skin reaction

The above should be used for products/mixtures containing the notified chemical, if applicable, based on the concentration of the notified chemical present and the intended use/exposure scenario.

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 during reformulation:
  - Enclosed, automated processes, where possible
  - Adequate local exhaust ventilation

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

- 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 during reformulation:
  - Coveralls
  - Impervious gloves
  - Eye protection
  - Respiratory protection, if inhalation exposure may occur

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

- A copy of the 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 GHS as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Disposal

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

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 containment, physical 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(1) of the Act; if
- the importation volume exceeds one tonne per annum notified chemical;
- the concentration of the notified chemical exceeds, or is intended to exceed, 0.01% concentration in cosmetic and household products;

or

(2) Under Section 64(2) of the Act; if
- the function or use of the chemical has changed from a fragrance ingredient, 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.

Safety Data Sheet
The SDS of the notified chemical and products containing the notified chemical provided by the notifier were reviewed by NICNAS. The accuracy of the information on the SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Takasago International (Singapore) Pte Ltd (ABN: 29 099 666 832)
Unit 12, 82-86 Pacific Highway
ST LEONARDS NSW 2065

NOTIFICATION CATEGORY
Limited-small volume: Chemical other than polymer (1 tonne or less per year)

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: other names, analytical data, degree of purity, use details 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
EU (2015)
China (2016)

2. IDENTITY OF CHEMICAL

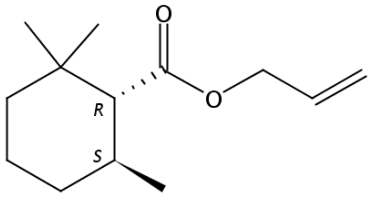
MARKETING NAME
Kajitsu Ester

CAS NUMBER
1648784-10-4

CHEMICAL NAME
Cyclohexanecarboxylic acid, 2,2,6-trimethyl-, 2-propen-1-yl ester, (1*R*,6*S*)-

MOLECULAR FORMULA
$C_{13}H_{22}O_2$

STRUCTURAL FORMULA



MOLECULAR WEIGHT
210.31 Da

ANALYTICAL DATA
Reference GC-FID, GC-MS, NMR and IR spectra were provided.

3. COMPOSITION

DEGREE OF PURITY
> 90%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Colourless to slightly yellow clear liquid.

Property	Value	Data Source/Justification
Freezing Point	< -20 °C	Measured
Boiling Point	242 ± 1 °C at 101.3 kPa	Measured
Density	936 kg/m^3 at 20.0 ± 0.5 °C	Measured
Vapour Pressure	11 Pa at 25 °C	Measured
Water Solubility	1.41 x 10^{-2} g/L at 20 °C	Measured
Hydrolysis as a Function of pH	$t_{1/2}$ > 1 year at 25 °C at pH=4 ,7, and 9	Measured
Partition Coefficient (n-octanol/water)	log Pow = 4.83 - 5.06	Measured
Surface Tension	68.9 ± 1.0 mN/m (90% saturated solution) at 21.2 ± 0.5 °C.	Measured
Adsorption/Desorption	log K_{oc} = 3.53 - 3.65	Estimated by using Pow method (KOCWIN v2.00, US EPA 2011)
Dissociation Constant	Not determined	The notified chemical does not contain dissociable functional groups.
Flash Point	101 ± 2 °C (closed cup)	Measured
Flammability	Combustible liquid*	Based on flash point
Flammability in contact with water	Not highly flammable in contact with water	The notified chemical does not contain chemical groups that might lead to ignition in contact with water and/or the evolution of a flammable gas.
Autoignition Temperature	302 ± 5 °C	Measured
Explosive Properties	No explosive properties	The notified chemical does not contain chemical groups which are associated with explosive properties.
Oxidising Properties	No oxidising properties	The notified chemical does not contain groups that act as an oxidising agent.

* Based on Australian Standard AS1940 definitions

DISCUSSION OF PROPERTIES

For full details of tests on physical and chemical properties, refer to Appendix A.

Reactivity

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

Physical hazard classification

Based on the submitted physico-chemical data depicted in the above table, the notified chemical is not recommended for hazard classification according to the GHS, as adopted for industrial chemicals in Australia.

The notified chemical has a flash point of 101 °C. Based on *Australian Standard AS1940* definitions for combustible liquids, a liquid that has a flash point of 150 °C or less is a Class C1 combustible liquid.

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 into Australia as a component of fragrance mixtures.

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

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

PORT OF ENTRY

The notified chemical will be imported to various ports around Australia.

TRANSPORTATION AND PACKAGING
Fragrance mixtures containing the notified chemical at ≤ 10% concentration will be introduced by sea and packaged in 200 L drums. The fragrance mixtures will be transported via road and railway for distribution.

USE
Fragrance mixtures containing the notified chemical at ≤ 10% concentration will be reformulated to produce a variety of finished consumer goods such as fine perfumes, personal care products, and household products. The notified chemical will be used at a final concentration of ≤ 0.01% in finished consumer products.

OPERATION DESCRIPTION
Reformulation of fragrance mixtures containing the notified chemical at ≤ 10% concentration into finished consumer goods may vary depending on the type of product produced and may involve both automated and manual transfer steps. Typically, reformulation processes may incorporate blending operations that are highly automated and occur in a fully enclosed/contained environment, followed by automated filling of the reformulated end-use products into containers of various sizes.

End-use products containing the notified chemical (at ≤ 0.01% concentration) will be used by consumers and professionals such as hairdressers, beauticians and cleaners. Depending on the nature of the product, these could be applied in a number of ways, such as by hand, using an applicator or sprayed.

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 and storage (10-20 workers)	1-2	50
Mixers (10-20 workers)	≤ 8	240
QC samplers (1-2 workers)	0.5	240
Cleaners/maintenance (5-10 workers)	≤ 8	240
End users (professionals) > 1,000	1-8	200

EXPOSURE DETAILS
Transport and storage
Transport, storage and warehouse workers may come into contact with the notified chemical at ≤ 10% concentration (in fragrance mixtures) or at ≤ 0.01% concentration (in final formulated products), only in the event of accidental rupture of containers. If such an event occurs, workers may be exposed to the notified chemical through dermal, ocular or inhalation exposure.

Formulation of end products
During reformulation, dermal, ocular and perhaps inhalation exposure of workers to the notified chemical at ≤ 10% concentration may occur during handling of drums, during weighing and transfer stages, blending, quality control analysis, and cleaning and maintenance of equipment. Exposure is expected to be minimised through the use of fully automated processes, local exhaust ventilation and/or enclosed systems and through the use of good industrial hygiene practices and PPE such as protective clothing, eye protection and impervious gloves.

End use professionals
End use professionals such as beauticians, hairdressers and cleaners may be exposed to the notified chemical at ≤ 0.01% concentration. The principal route of exposure will be dermal, while ocular and inhalation exposure is also possible. Such professionals may use some PPE to minimise repeated exposure and good hygiene practices are expected to be in place. If PPE is used, exposure of such workers is expected to be of a similar or less extent than that experienced by consumers using products containing the notified chemical.

6.1.2. Public Exposure
There will be widespread and repeated exposure of the public to the notified chemical (at ≤ 0.01% concentration) through the use of the cosmetic and household products. The main route of exposure will be dermal, while ocular and inhalation exposure is also possible, particularly if products are applied by spray.

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 B.

Endpoint	*Result and Assessment Conclusion*
Rat, acute oral toxicity	LD50 > 2000 mg/kg bw; low toxicity
Rat, acute dermal toxicity	LD50 > 2000 mg/kg bw; low toxicity
Rabbit, skin irritation	mildly irritating
Rabbit, eye irritation	slightly irritating
Mouse, skin sensitisation – Local lymph node assay (LLNA)	evidence of sensitisation
Mutagenicity – bacterial reverse mutation	non mutagenic
Genotoxicity – *in vitro* mammalian chromosomal aberration test	non genotoxic
Genotoxicity – *in vitro* mammalian cells micronucleus test	non genotoxic

Toxicokinetics

Given the low molecular weight (210.31 Da) and partition coefficient (log P_{OW} = 4.83 – 5.06) of the notified chemical, there is potential for the notified chemical to be readily absorbed across biological membranes.

Acute toxicity

The notified chemical was found to be of low acute oral and dermal toxicity in studies conducted in rats.

Irritation and sensitisation

Based on studies conducted in rabbits, the notified chemical is mildly irritating to skin and slightly irritating to eyes.

In the skin irritation study, well-defined erythema and very slight to slight oedema were noted after exposure to the notified chemical for up to 72 hours. Moderate desquamation was also noted in one animal 7 days after exposure. All signs of irritation were resolved at the 14-day observation. The notified chemical is irritating to skin; however the findings observed did not warrant hazard classification under the GHS.

In the eye irritation study, moderate conjunctival irritation was noted after exposure to the notified chemical. This effect was reduced to minimal by 72 hours and disappeared 7 days after the exposure. Based on the effect observed, the notified chemical is considered to be slightly irritating to the eyes. However, the scores of the effect observed did not warrant a classification under the GHS.

In a mouse LLNA, the notified chemical showed evidence of skin sensitisation with an EC3 of 64%.

Mutagenicity/Genotoxicity

The notified chemical tested negative in a bacterial reverse mutation assay, in an *in vitro* chromosomal aberration test and in an *in vitro* mammalian cell micronucleus test.

Health hazard classification

Based on the available information, the notified chemical is recommended for hazard classification according to the *Globally Harmonised System of 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***
Skin Sensitiser Category 1B	H317 – May cause an allergic skin reaction

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

Based on the available information the critical health effect of the notified chemical is skin sensitisation with the chemical also being a slight skin and eye irritant. The toxicity of the notified chemical following repeated exposure is unknown.

Reformulation

During reformulation workers may be at risk of sensitisation when handling the notified chemical at ≤ 10% concentration. It is anticipated by the notifier that engineering controls such as enclosed and automated processes

and local ventilation will be implemented where possible, and appropriate PPE will be used to limit workers exposure.

End-use
End use professionals such as be beauticians, hairdressers and cleaners may be exposed to the notified chemical at ≤ 0.01% concentration. Dermal, and to a lesser extent, ocular and inhalation exposure may occur. PPE may be employed by these professionals to minimise repeated exposure and good hygiene practices are expected to be in place. If PPE is used, the risk to such workers is expected to be of a similar or lesser extent than that for consumers using products containing the notified chemical at ≤ 0.01% concentration.

Therefore, under the occupational settings described, the risk to the health of workers from use of the notified chemical is not considered to be unreasonable.

6.3.2. Public Health

Irritation
The notified chemical is mildly irritating to skin and slightly irritating to eyes. Given the low proposed use concentration of the notified chemical in cosmetic products (i.e. ≤ 0.01%), irritation effects are not expected.

Skin sensitisation
Proposed methods for the quantitative risk assessment of the dermal sensitisation have been the subject of significant discussion (i.e., Api *et al.,* 2008 and RIVM, 2010). Using fine fragrance as an example product that may contain the notified chemical (at a maximum of 0.01% concentration), as a worst case scenario, the Consumer Exposure Level (CEL) for the notified chemical is estimated to be 0.38 μg/cm^2/day (Cadby *et al.,* 2002). When tested in an LLNA study, the notified chemical was a skin sensitiser with an EC3 value of 64%. Consideration of the study details and application of appropriate safety factors allowed the derivation of an Acceptable Exposure Level (AEL) of 49.92 μg/cm^2/day. In this instance, the factors employed included an interspecies factor (3), intraspecies factor (10), a matrix factor (3.16), use/time factor (3.16) and database factor (1), giving an overall safety factor of > 300 (300 used for calculation).

As the CEL is estimated to be less than the AEL, the risk to the public of induction of sensitisation that is associated with the use of fine fragrances (a worst case example of a leave-on cosmetic product) is not considered to be unreasonable. Based on the lower expected exposure level from other cosmetic and household products, by inference, the risk of induction of sensitisation associated with the use of these products is also not considered to be unreasonable. However, it is acknowledged that consumers may be exposed to multiple products containing the notified chemical, and a quantitative assessment based on aggregate exposure has not been conducted.

Repeat dose toxicity
The repeated dose toxicity effects of the notified chemical have not been determined. However, exposure is expected to be limited by the low concentration of the notified chemical (≤ 0.01%) in end use products.

Therefore, based on the information available, the risk to the public associated with the use of the notified chemical at ≤ 0.01% concentration in cosmetic and household products 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 notified chemical will be imported as a component in finished products or as a component of fragrance formulations, for reformulation into finished cosmetic formulations and household products. There is unlikely to be any significant release to the environment from transport and storage, except in the case of accidental spills and leaks. In the event of spills, the product containing the notified chemical is expected to be collected with adsorbents, and disposed of to landfill in accordance with local government regulations.

The reformulation process will involve blending operations that will be highly automated, and is expected to occur within a fully enclosed environment. Therefore, significant release of the notified chemical from this

process to the environment is not expected. Wastes containing the notified chemical generated during reformulation include equipment wash water, residues in empty import containers and spilt materials. This will be collected and released to sewers in a worst case scenario, or disposed of to landfill in accordance with local government regulations. Empty import containers are expected to be recycled or disposed of to landfill.

RELEASE OF CHEMICAL FROM USE
The notified chemical is expected to be released to the aquatic compartment through sewers during its use in various cosmetic formulations and household products.

RELEASE OF CHEMICAL FROM DISPOSAL
The notified chemical may remain in containers once the consumer products are used up. Wastes and residues of the notified chemical in empty containers are likely to either share the fate of the container and be disposed of to landfill, or be released to the sewer system when containers are rinsed before recycling through an approved waste management facility.

7.1.2. Environmental Fate

Following its use in cosmetic formulations and household products in Australia, the majority of the notified chemical is expected to enter the sewer system, before potential release to surface waters nationwide. Based on the result of the ready biodegradability study, the notified chemical is not considered readily biodegradable (0% in 28 days). For details of the environmental fate studies, please refer to Appendix C. Based on its moderate water solubility and estimated high adsorption coefficient (log Koc = 3.53-3.65), release to surface waters may not occur as partitioning to sludge and sediment is expected under environmental pH. Although the notified chemical has a high partition coefficient the notified chemical is not likely to bioaccumulate, based on its predicted low bioconcentration factor (log BCF = 250.7, BCFBAF v3.01, US EPA, 2011). In surface waters the notified chemical is expected to disperse and degrade through biotic and abiotic processes to form water and oxides of carbon.

The majority of the notified chemical will be released to sewer after use. A small proportion of the notified chemical may be applied to land when effluent is used for irrigation, or when sewage sludge is used for soil remediation. The notified chemical may also be applied to land when disposed of to landfill as collected spills and empty container residue. The notified chemical in landfill, soil and sludge are expected to eventually degrade through biotic and abiotic processes to form water and oxides of carbon.

7.1.3. Predicted Environmental Concentration (PEC)

The predicted environmental concentration (PEC) has been calculated to assume a worst case scenario, with 100% release of the notified chemical into sewer systems nationwide and no removal within sewage treatment plants (STPs).

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	1,000	kg/year
Proportion expected to be released to sewer	100%	
Annual quantity of chemical released to sewer	1,000	kg/year
Days per year where release occurs	365	days/year
Daily chemical release:	2.74	kg/day
Water use	200.0	L/person/day
Population of Australia (Millions)	22.613	million
Removal within STP	0%	
Daily effluent production:	4,523	ML
Dilution Factor - River	1.0	
Dilution Factor - Ocean	10.0	
PEC - River:	0.61	µg/L
PEC - Ocean:	0.06	µg/L

STP effluent re-use for irrigation occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1,000 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 1,500 kg/m^3). Using these assumptions, irrigation with a concentration of 0.61 µg/L may potentially result in a soil concentration of approximately 4.04 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 20.19 µg/kg and 40.39 µg/kg, respectively.

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 = 5.96 mg/L	Toxic to fish
Daphnia Toxicity	48 h EC50 = 1.6 mg/L	Toxic to aquatic invertebrates
Algal Toxicity	96 h E_rC50 = 5.5 mg/L	Toxic to algae

Under the GHS the notified chemical is toxic to fish, aquatic invertebrates and algae, and is formally classified as 'Acute Category 2: Toxic to aquatic life'. Based on the acute toxicity and lack of ready biodegradability of the notified chemical, it is classified as 'Chronic Category 2: Toxic to aquatic life with long lasting effects'.

7.2.1. Predicted No-Effect Concentration

The predicted no-effects concentration (PNEC) has been calculated from the most sensitive endpoint for invertebrates. A safety factor of 100 was used given acute endpoints for three trophic levels are available.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (Invertebrates)	1.6	mg/L
Assessment Factor	100	
Mitigation Factor	1.00	
PNEC:	16	µg/L

7.3. Environmental Risk Assessment

The Risk Quotient (Q = PEC/PNEC) has been calculated based on the predicted PEC and PNEC.

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River	0.61	16	0.038
Q - Ocean	0.06	16	0.004

The risk quotient for discharge of treated effluents containing the notified chemical to the aquatic environment indicates that the notified chemical is unlikely to reach ecotoxicologically significant concentrations in surface waters, based on its maximum annual importation quantity. The notified chemical is not readily biodegradable. On the basis of the PEC/PNEC ratio, maximum annual importation volume and assessed use pattern in cosmetic formulations and household products, the notified chemical is not expected to pose an unreasonable risk to the environment.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Freezing Point < -20 °C

Method	OECD TG 102 Melting Point/Melting Range, 27 July 1995 EC Council Regulation No 440/2008 A.1 Melting/Freezing Temperature, 30 May 2008
Remarks	The notified chemical did not freeze during cooling from -9.5 to -21 °C
Test Facility	Harlan (2015a)

Boiling Point 242 ± 1 °C at 101.3 kPa

Method	OECD TG 103 Boiling Point, 27 July 1995 EC Council Regulation No 440/2008 A.2 Boiling Temperature, 30 May 2008
Remarks	Differential scanning calorimetry method was used.
Test Facility	Harlan (2015a)

Density 936 kg/m^3 at 20.0 ± 0.5 °C

Method	OECD TG 109 Density of Liquids and Solids, 2 October 2012 EC Council Regulation No 440/2008 A.3 Relative Density, 30 May 2008
Remarks	Pycnometer method was used.
Test Facility	Harlan (2015a)

Vapour Pressure 11 Pa at 25 °C

Method	OECD TG 104 Vapour Pressure, 23 March 2006 EC Council Regulation No 440/2008 A.4 Vapour Pressure, 30 May 2008
Remarks	Vapour pressure balance method was used. The result was extrapolated from 5 individual tests.
Test Facility	Harlan (2014a)

Water Solubility 1.41×10^{-2} g/L at 20 °C

Method	OECD TG 105 Water Solubility
Remarks	Flask Method
Test Facility	Harlan (2015a)

Hydrolysis as a Function of pH $t_{½}$ > 1 year at 25 °C at pH 4, 7, 9

Method OECD TG 111 Hydrolysis as a Function of pH

pH	*T (°C)*	*$t_{½}$ (years)*
4	25	> 1
7	25	> 1
9	25	> 1

Remarks	The rate graphs indicate that a percentage of the test item was degraded fairly rapidly initially, followed by a consistent slowing of the early rate of degradation to essentially zero. It was concluded that the initial, rapid loss of test item noted at all three pH's at all three test temperatures was probably due to oxidation and/or some other non-hydrolysis process. Thus, it was concluded that the test item was essentially stable towards hydrolysis.
Test Facility	Harlan (2015a)

Partition Coefficient (n-octanol/water) log Pow = 4.83 - 5.06

Method	OECD TG 117 Partition Coefficient (n-octanol/water)
Remarks	HPLC Method
Test Facility	Harlan (2015a)

Surface Tension 68.9 ± 1.0 mN/m at 21.2 ± 0.5 °C

Method	OECD TG 115 Surface Tension of Aqueous Solutions EC Council Regulation No 440/2008 A.5 Surface Tension
Remarks	– Ring method was used. Ring circumference was 4 cm instead of 6 cm (as specified in the guidelines). The study authors note that the reduced ring dimensions did not affect the integrity of the test. – Concentration: 90% (saturated)
Test Facility	Harlan (2015a)

Flash Point 101 ± 2 °C (closed cup)

Method	EC Council Regulation No 440/2008 A.9 Flash Point, 30 May 2008
Remarks	Closed cup equilibrium method was used.
Test Facility	Harlan (2014b)

Flammability in Contact with Water Not highly flammable in contact with water

Method	EC Council Regulation No 440/2008 A.12 Flammability (Contact with Water), May 31 2008
Remarks	The test substance does not contain groups that might lead to ignition in contact with water and/or to the evolution of a flammable gas (statement provided by the study authors).
Test Facility	WIL (2014)

Autoignition Temperature 302 ± 5 °C

Method	EC Council Regulation No 440/2008 A.15 Auto-Ignition Temperature (Liquids and Gases), 30 May 3008
Remarks	Procedure based on Anon (1987) using a Carbolite flask heater
Test Facility	Harlan (2014b)

Explosive Properties No explosive properties

Method	EC Council Regulation No 440/2008 A.14 Explosive Properties, May 31 2008
Remarks	The test substance does not contain chemical groups which are associated with explosive properties (statement provided by the study authors).
Test Facility	WIL (2014a)

Oxidizing Properties No oxidising properties

Method	EC Council Regulation No 440/2008 A.21 Oxidizing Properties (Liquids), May 31 2008
Remarks	The test substance does not contain groups that act as an oxidising agent (statement provided by the study authors).
Test Facility	WIL (2014a)

APPENDIX B: TOXICOLOGICAL INVESTIGATIONS

B.1. Acute toxicity – oral

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 420 Acute Oral Toxicity - Fixed Dose Method, 2001. EC Directive92/69/EEC B.1bis Acute Toxicity (Oral) Fixed Dose Method.
Species/Strain	Rat/ HanRcc:WIST
Vehicle	Arachis oil BP
Remarks - Method	No significant protocol deviations

RESULTS

Sighting Study

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	1	300	0/1
2	1	2000	0/1

Signs of Toxicity	No signs of systemic toxicity were noted during the observation period following the 300 mg/kg bw dose. Signs of systemic toxicity noted during the first four hours after the 2000 mg/kg bw dose included hunched posture, noisy respiration and ataxia. These symptoms were not present 1 day after dosing, until the end of the observation period. Animal body weights were within normal range for their strain and relevant age.
Effects in Organs	None

Main Study

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	4F	2000	1/4

LD50	> 2000 mg/kg bw
Signs of Toxicity	Symptoms of systemic toxicity were first noted one day after dosing. Signs included hunched posture, tiptoe gait, pilo-erection and emaciation for 3/4 animals. One animal displayed hunched posture, pilo-erection, lethargy, red/brown staining around the eyes, decreased respiratory rate and hypothermia. The combination of these signs exceeded the severity limit set in the UK Home office Project Licence. As a consequence, this animal was killed one day after dosing for humane reasons. Symptoms displayed by the remaining animals two days after dosing were reduced to hunched posture. All symptoms had disappeared by the third day after dosing and did not return for the remainder of the study.
Effects in Organs	The animal killed humanely after day one presented pale patches on the liver and pale kidneys. No macroscopic abnormalities were noted at necropsy of animals that were killed at the end of the study.
Remarks - Results	Animal body weights were within normal range for their strain and age.

CONCLUSION	The notified chemical of low toxicity via the oral route.
TEST FACILITY	Harlan (2014c)

B.2. Acute toxicity – dermal

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 402 Acute Dermal Toxicity, 24 February 1987
Species/Strain	Rat/Sprague-Dawley (Crl:CD(SD)), SPF
Vehicle	None
Type of dressing	Occlusive
Remarks - Method	No significant protocol deviations. In a separate preliminary study, one male and one female rat were dermally dosed with 2000 mg/kg bw of the test substance. No mortality occurred. Therefore, the dose for the test substance group in this study was 2000 mg/kg bw.

RESULTS

Group	*Number and Sex of Animals*	*Dose (mg/kg bw)*	*Mortality*
Control	5 M/5 F	0	0/5
Test substance	5 M/5 F	2000	0/5

LD50	> 2000 mg/kg bw
Signs of Toxicity - Local	None
Signs of Toxicity - Systemic	None
Effects in Organs	None
Remarks - Results	No clinical signs or mortality was observed during the study period. Animal body weights were within normal range for their strain and relevant age. No macroscopic abnormalities were recorded during post mortem examination.
CONCLUSION	The notified chemical is of low toxicity via the dermal route.
TEST FACILITY	Biotoxtech (2014a)

B.3. Irritation – skin

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 404 Acute Dermal Irritation/Corrosion, 24 April 2002. EC Council Regulation No 440/2008 B.4 Acute Toxicity (Skin Irritation).
Species/Strain	Rabbit/New Zealand White (Hsdlf:NZW)
Number of Animals	2
Vehicle	None
Observation Period	14 days
Type of Dressing	Semi-occlusive.
Remarks - Method	No significant protocol deviations. Initially, one animal was treated on three separate sites. Patches were removed at the following time points: 3 minutes, 1 hour and 4 hours after application. After consideration of the skin reactions produced in the animal, an additional animal was treated with a single patch for 4 hours. Test sites (all exposure periods) were assessed for evidence of primary irritation immediately after treatment and at the following time points thereafter: 1 hour, 24 hours, 48 hours, 72 hours and 7 days. Areas treated for 4 hours were additionally assessed 14 days after treatment.

RESULTS

Lesion	*Mean Score* Animal No.*		*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2			
Erythema/Eschar	2.0	2.0	2.0	< 7 days	0
Oedema	1.3	2.0	2.0	< 7 days	0

* Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal after 4 –hour exposure.

Remarks - Results

3-Minute Exposure Period
Very slight erythema and very slight oedema was noted immediately and one-hour after treatment. All signs of irritation were resolved at the 24-hour observation.

1-Hour Exposure Period
Very slight erythema appeared at all time points up to 72 hours after treatment. Very slight oedema was noted at all time points up to 24 hours after treatment. All signs of irritation were resolved at the 7-day observation.

4-Hour Exposure Period
In both animals, well-defined erythema appeared at all time points up to 72 hours after treatment. Furthermore, one animal displayed erythema that extended 10 cm beyond the test site at all time points up to 24 hours after treatment, followed by moderate desquamation noted 7 days after treatment. One animal displayed slight oedema at all time points up to 24 hours after treatment. This was downgraded to very slight oedema at 48 and 72 hours after treatment. The second animal displayed slight oedema at all time points up to 72 hours after treatment. This was accompanied by oedema extending ventrally below the test site both immediately and 1 hour after treatment. All signs of irritation were resolved at the 14-day observation.

CONCLUSION

The notified chemical is moderately irritating to the skin.

TEST FACILITY

Harlan (2014d)

B.4. Irritation – eye

TEST SUBSTANCE

Notified chemical

METHOD

OECD TG 405 Acute Eye Irritation/Corrosion, 2 October 2012.
EC Council Regulation No 440/2008 B.5 Acute Toxicity (Eye Irritation).

Species/Strain: Rabbit/New Zealand White (Hsdlf:NZW)
Number of Animals: 2
Observation Period: 7 days
Remarks - Method: No significant protocol deviations.

RESULTS

Lesion	*Mean Score* Animal No.*		*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2			
Conjunctiva: redness	1.7	1.3	2.0	< 7 days	0
Conjunctiva: chemosis	0.7	0.7	2.0	< 72 hours	0
Conjunctiva: discharge	0.7	0.3	2.0	< 72 hours	0
Corneal opacity	0	0	0	-	0
Iridial inflammation	0	0	0	-	0

* Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks - Results

No corneal or iridial effects were noted during the study. Moderate conjunctival irritation was noted in both animals up to the 48 hour observation. All signs of irritation were resolved in one animal at the 72-hour observation, with minimal conjunctival irritation observed in the other. All signs of irritation were resolved at the 7-day observation.

CONCLUSION

The notified chemical is slightly irritating to the eye.

TEST FACILITY Harlan (2014e)

B.5. Skin sensitisation – mouse LLNA

TEST SUBSTANCE Notified chemical

METHOD OECD TG 429 Skin Sensitisation: Local Lymph Node Assay, 22 July 2010.

Species/Strain	Mouse - CBA/J(SPF)
Vehicle	Acetone:olive oil 4:1 (v/v)
Preliminary study	Yes
Positive control	α-Hexylcinnamaldehyde (HCA).
Remarks - Method	No significant protocol deviations.

RESULTS

Concentration (% w/w)	*Number and sex of animals*	*Proliferative response (DPM/animal)*	*Stimulation Index (Test/ Vehicle Control Ratio)*
Test Substance			
0 (vehicle control)	4F	866.7	-
25	4F	2404.8	2.8
50	4F	2515.7	2.9
100	4F	2922.5	3.4
Positive Control			
25	4F	7800.0	9.0

EC3	64%
Remarks - Results	No animals displayed abnormal clinical signs or erythema due to the test substance during the observation period. There were no body weight changes due to the test substance or positive control during the sensitisation period. Lymph node weights for all test groups and the positive control group were higher than those in the vehicle control group. No animals displayed increases in ear thickness during the sensitisation period.

CONCLUSION There was evidence of induction of a lymphocyte proliferative response indicative of skin sensitisation to the notified chemical.

TEST FACILITY BSRC (2013)

B.6. Genotoxicity – bacteria

TEST SUBSTANCE Notified chemical.

METHOD OECD TG 471 Bacterial Reverse Mutation Test, 21 July 1997.
Pre incubation procedure

Species/Strain	*S. typhimurium*: TA1535, TA1537, TA98, TA100 *E. coli*: WP2*uvr*A
Metabolic Activation System	S9 fraction from phenobarbital/5,6 benzoflavone induced rat liver
Concentration Range in Main Test	a) With metabolic activation: 9.77 – 313 µg/plate (all *S. typhimurium* strains) 39.1 – 1250 µg/plate (*E. coli*: WP2uvrA strain) b) Without metabolic activation: 2.44 – 78.1 µg/plate
Vehicle	DMSO
Remarks - Method	No significant protocol deviations. The doses for the main study were chosen based on the results of a dose-finding study.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/plate) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test 1	≥ 78.1	≥ 39.1	> 78.1	> 78.1
Test 2	-	≥ 39.1	> 78.1	> 78.1
Present				
Test 1	≥ 313*	≥ 156	> 1250	> 1250
Test 2	-	≥ 156	> 1250	> 1250

* Cytotoxicity ≥ 1250 µg/plate in the preliminary test for *E. coli*: WP2uvrA strain in the presence of metabolic activation.

Remarks - Results	No substantial increase in revertant colony numbers of any of the five tester strains was observed following treatment with the test substance at any dose level, in the presence or absence of metabolic activation. Positive controls performed as expected, confirming the validity of the test system. Reproducibility observed between the results of the main study and confirmatory study, further confirming the validity of the study.
CONCLUSION	The notified chemical was not mutagenic to bacteria under the conditions of the test.
TEST FACILITY	CMIC (2013)

B.7. Genotoxicity – *in vitro* mammalian chromosome aberration

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 473 *In vitro* Mammalian Chromosome Aberration Test, 21 July 1997.
Species/Strain	Chinese hamster
Cell Type/Cell Line	Lung / (CHL/IU)
Metabolic Activation System	S9 fraction from phenobarbital/5,6 benzoflavone induced rat liver
Vehicle	Acetone
Remarks - Method	No significant protocol deviations. A preliminary experiment was conducted to determine the dose range for the main test.

Metabolic Activation	*Test Substance Concentration (µg/mL)*	*Exposure Period*	*Harvest Time*
Absent			
Test 1	0, 9.5*, 19.0* , 38.0*, 76.0	6 h	24 h
Test 2	0, 8.88*, 17.8*, 35.5*, 71.0	24 h	24 h
Present			
Test 1	0, 18.0*, 36.0*, 72.0*, 144.0	6 h	24 h
Test 2	0, 18.0*, 36.0*, 72.0*, 144.0	6 h	24 h

*Cultures selected for metaphase analysis.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/mL) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test 1	≥ 76.0	≥ 76.0	> 76.0	Negative
Test 2	≥ 78.1	≥ 35.5	> 71.0	Negative
Present				
Test 1	≥ 156.0	≥ 144.0	> 144.0	Negative
Test 2	-	≥ 144.0	> 144.0	Negative

Remarks - Results	In Tests 1 and 2 with and without metabolic activation, no biologically relevant increase of aberration rates or polyploidy cell frequency was observed compared to negative controls. The positive controls performed as expected, confirming the validity of the test system.
CONCLUSION	The notified chemical was not clastogenic to Chinese hamster lung cells treated *in vitro* under the conditions of the test.
TEST FACILITY	Biotoxtech (2014b)

B.8. Genotoxicity – *in vitro* mammalian cell micronucleus

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 487 *In Vitro* Mammalian Cell Micronucleus Test, 22 July 2010.
Species/Strain	Chinese hamster
Cell Type/Cell Line	Lung fibroblast / (CHL/IU)
Metabolic Activation System	S9 fraction from phenobarbital/5,6 benzoflavone induced rat liver
Vehicle	DMSO
Remarks - Method	No significant protocol deviations. A preliminary experiment was conducted to determine the dose range for the main test.

Metabolic Activation	*Test Substance Concentration (µg/mL)*	*Exposure Period*	*Harvest Time*
Absent			
Test 1	83.5, 93.7*, 105.0*, 118.0*, 133.0	6 h	24 h
Test 2	66.3*, 74.4*, 83.5*, 93.7, 105.0	24 h	24 h
Test 3	66.3*, 74.4*, 83.5*, 93.7, 105.0	48 h	48 h
Present			
Test 1	93.7, 105.0*, 118.0*, 133.0*, 149.0, 167.0	6 h	24 h

*Cultures selected for micronucleus analysis.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/mL) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test 1	≥ 105.0	≥ 105.0	> 133.0	Negative
Test 2	≥ 105.0	≥ 83.5	> 105.0	Negative
Test 3	≥ 105.0	≥ 74.4	> 105.0	Negative
Present				
Test 1	≥ 210.0	≥ 118.0	> 167.0	Negative

Remarks - Results	No increase in either micronucleated or multinucleated cells was observed in any of the tests using short-term treatment processes with or without metabolic activation or using continuous treatment processes. Positive and negative controls performed as expected, confirming the validity of the test system.
CONCLUSION	The notified chemical was not clastogenic to Chinese hamster lung cells treated *in vitro* under the conditions of the test.
TEST FACILITY	UBE (2014)

APPENDIX C: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

C.1. Environmental Fate

C.1.1. Ready biodegradability

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 301 C Ready Biodegradability: Modified MITI Test (I).
Inoculum	Activated sewage sludge
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Liquid chromatography-tandem mass spectrometry (LC-MSMS)
Remarks - Method	Conducted in accordance with the test guidelines above, and in compliance with GLP standards and principles.

RESULTS

Test substance		*Aniline*	
Day	*% Degradation*	*Day*	*% Degradation*
7	-1	7	73
14	-6	14	89
21	-7	21	88
28	-7	28	88

Remarks - Results	All validity criteria of the test guideline were satisfied. The percentage degradation of the reference compound (aniline) surpassed the threshold level of 60% after 7 days (73%), and attained 88% degradation in 28 days. Therefore, the tests indicate the suitability of the inoculums. The degree of degradation of the test substance after 28 days was 0% (as the calculated average value was negative). Therefore, the test substance is not considered to be readily biodegradable according to the OECD (301 C) guideline.
CONCLUSION	The notified chemical is not readily biodegradable.
TEST FACILITY	CERI (2014)

C.2. Ecotoxicological Investigations

C.2.1. Acute toxicity to fish

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 203 Fish, Acute Toxicity Test - Static.
Species	*Oryzias latipes* (Ricefish)
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	70mg $CaCO_3$/L
Analytical Monitoring	Gas chromatography
Remarks – Method	Conducted in accordance with the test guidelines above, and in compliance with GLP standards and principles.

RESULTS

Concentration mg/L		*Number of Fish*	*Mortality*				
Nominal	*Actual*		*1 h*	*24 h*	*48 h*	*72 h*	*96 h*
Control	-	10	0	0	0	0	0
10	1.64	10	0	0	0	0	0
18	2.94	10	0	0	0	0	0
32	5.50	10	0	10	10	20	20
56	7.86	10	10	100	100	100	100
100	15.95	10	20	100	100	100	100

LC50	5.96 mg/L (95% CI 5.26 - 6.75 mg/L) at 96 hours.
NOEC (or LOEC)	2.94 mg/L at 96 hours.
Remarks – Results	All validity criteria of the test guideline were satisfied. The fish were exposed to the control and test solutions for a period of 96 hours. The 96 h LC50 and NOEC for fish were determined to be 5.96 mg/L and 2.94 mg/L respectively, based on measured concentrations.

CONCLUSION The notified chemical is considered to be toxic to fish.

TEST FACILITY Biotoxtech (2014c)

C.2.2. Acute toxicity to aquatic invertebrates

TEST SUBSTANCE Notified chemical

METHOD OECD TG 202 Daphnia sp. Acute Immobilisation Test and Reproduction Test – Semi Static

Species	*Daphnia magna*
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	144 mg $CaCO_3$/L
Analytical Monitoring	Gas chromatography
Remarks - Method	Conducted in accordance with the test guidelines above, and in compliance with GLP standards and principles.

RESULTS

Concentration mg/L		*Number of D. magna*	*Number Immobilised*	
Nominal	*Actual*	*24 h*	*24 h*	*48 h*
Control	Control	20	0	0
10	1.1	20	0	0
18	1.4	20	0	45
32	2.9	20	45	100
56	4.1	20	100	100
100.0	7.2	20	100	100

EC50	1.6 mg/L (95% CI 1.5-1.8 mg/L) at 48 hours
NOEC (or LOEC)	1.1 mg/L at 48 hours
Remarks - Results	All validity criteria of the test guideline were satisfied. The test solutions were renewed at 24 hours during the 48 h test period. The 48 h EC50 and NOEC for Daphnia were determined to be 1.6 mg/L and 1.1 mg/L, respectively, based on mean measured concentrations.

CONCLUSION The notified chemical is considered to be toxic to aquatic invertebrates.

TEST FACILITY Harlan (2015b)

C.2.3. Algal growth inhibition test

TEST SUBSTANCE	Notified chemical
METHOD	US EPA Ecological Effects Test Guideline OCSPP 850.5400: Algal Toxicity
Species	*Pseudokirchneriella subcapitata* (green alga)
Exposure Period	96 hours
Concentration Range	Nominal: 6.25, 12.5, 25, 50 and 100% v/v saturated solution Actual: 0.0081, 5.2, 7.1, 7.0, 9.2 mg/L
Auxiliary Solvent	None
Water Hardness	Not reported
Analytical Monitoring	Gas chromatography
Remarks - Method	Conducted in accordance with the test guidelines above, and in compliance with GLP standards and principles. As the test item is poorly water soluble, a saturated solution was prepared by stirring an excess (100 mg/L) of test item in culture medium for 24 hours prior to removing any undissolved test item present (by filtration) to give a saturated solution of the test item.

RESULTS

Biomass		*Growth*	
EC50 *mg/L at 96 h*	*NOEC* *mg/L*	*EC50* *mg/L at 96 h*	*NOEC* *mg/L*
> 5.5	5.5	> 5..5	5.5

Remarks - Results	All validity criteria of the test guideline were satisfied. As the measured test concentrations showed a decline, the results were based on the time-weighted mean measured test concentrations in order to give a worst case analysis of the data. The 96 h EC50 and NOEC for algae were determined to be >5.5 mg/L and 5.5 mg/L, respectively, based on time-weighted mean measured concentrations.
CONCLUSION	The notified chemical is considered to be toxic to algae.
TEST FACILITY	Harlan (2015c)

BIBLIOGRAPHY

Anon (1987) Electrical Apparatus for Explosive Gas Atmospheres. Part 4: Method of Test for Ignition Temperature. *IEC Publications 79-4,* P1-19.

Api AM, Basketter DA, Cadby PA, Cano MF, Ellis G, Gerberick GF, Griem P, McNamee PM, Ryan CA and Safford R (2008) Dermal Sensitisation Quantitative Risk Assessment (QRA) for Fragrance Ingredients, Regulatory Toxicology and Pharmacology, 52:3-23.

Biotoxtech (2014a) Acute Dermal Dose Toxicity of [Notified Chemical] in Sprague-Dawley Rats (Study No. J14218, August, 2014). Chungcheongbuk-do, Korea, Biotoxtech Co., Ltd. (Unpublished report submitted by notifier).

Biotoxtech (2014b) *In Vitro* Chromosome Aberration Test of [Notified Chemical] using Mammalian Cultured Cell (Study No. J14219, October, 2014). Chungcheongbuk-do, Korea, Biotoxtech Co., Ltd. (Unpublished report submitted by notifier).

Biotoxtech (2014c) Acute Toxicity of [Notified Chemical] in Fish (Ricefish, *Oryzias latipes*) (Study No. J14221, November, 2014). Chungcheongbuk-do, Korea, Biotoxtech Co., Ltd. (Unpublished report submitted by notifier).

BSRC (2013) Mouse Local Lymph Node Assay of [Notified Chemical] (Study No. E930 (432-027), October, 2013). Shizuoka, Japan, Public Interest Incorporated Foundation Biosafety Research Center (Unpublished report submitted by notifier).

Cadby et al. (2002) Consumer Exposure to fragrance Ingredients: Providing Estimates for Safety Evaluation. Regulatory Toxicology and Pharmacology 36: 246- 252.

CERI (2014) Biodegradation study of [Notified Chemical] (Study No. 16057, March, 2014). Japan, Kurume, Chemicals Evaluation and Research Institute (Unpublished report submitted by notifier).

CMIC (2013) Bacterial Reverse Mutation Test of [Notified Chemical] (Study No. 13K3928G, July, 2013). Yamanashi, Japan, CMIC Bioresearch Center Co., Ltd. (Unpublished report submitted by notifier).

Harlan (2015a) [Notified Chemical]: Determination of General Physico-Chemical Properties (Study No. 41401300, April, 2015). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2015b) [Notified Chemical]: Daphnia sp., 48-Hour Acute Immobilization Test (Study No. 41401306, January, 2015). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2015c) [Notified Chemical]: Algal Growth Inhibition Test (Study No. 41401307, January, 2015). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2014a) [Notified Chemical]: Determination of Vapor Pressure (Study No. 41401301, November, 2014). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2014b) [Notified Chemical]: Determination of Flash Point and Auto-Ignition Temperature (Liquids and Gases) (Study No. 41401302, December, 2014). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2014c) [Notified Chemical]: Acute Oral Toxicity in the Rat – Fixed Dose Method (Study No. 41401303, November, 2014). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2014d) [Notified Chemical]: Acute Dermal Irritation in the Rabbit (Study No. 41401304, November, 2014). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

Harlan (2014e) [Notified Chemical]: Acute Eye Irritation in the Rabbit (Study No. 41401305, November, 2014). Derbyshire, U.K., Harlan Laboratories Ltd (Unpublished report submitted by notifier).

RIVM (2010) Observations on the Methodology for Quantitative Risk Assessment of Dermal Allergens, Report 320015003/2010, National Institute for Public Health and the Environment.

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.

UBE (2014) *In Vitro* Mammalian Cell Micronucleus Test (Study No. USA-R-14146, August, 2014). Yamaguchi Pref., Japan, UBE Scientific Analysis Laboratory Inc. (Unpublished report submitted by notifier). 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 >.

WIL (2014) Determination of Physico-Chemical Properties of [Notified Chemical] (Study No. 507322, November, 2014). DD 's-Hertogenbosch, The Netherlands, WIL Research Europe B.V. (Unpublished report submitted by notifier).