

## SCREENING-LEVEL HAZARD CHARACTERIZATION

### Cyclohexanol (CASRN 108-93-0)

The High Production Volume (HPV) Challenge Program<sup>1</sup> was conceived as a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsored chemicals; sponsorship entailed the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data did not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to “SIDS” (Screening Information Data Set<sup>1,2</sup>) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency’s Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored chemicals by developing hazard characterizations (HCs). These HCs consist of an evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. They are not intended to be definitive statements regarding the possibility of unreasonable risk of injury to health or the environment.

The evaluation is performed according to established EPA guidance<sup>2,3</sup> and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor’s responses to comments and revisions made to the submission. In order to determine whether any new hazard information was developed since the time of the HPV submission, a search of the following databases was made from one year prior to the date of the HPV Challenge submission to the present: (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, IRIS, NTP, ATSDR, IARC, EXTOWNET, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. OPPT’s focus on these specific sources is based on their being of high quality, highly relevant to hazard characterization, and publicly available.

OPPT does not develop HCs for those HPV chemicals which have already been assessed internationally through the HPV program of the Organization for Economic Cooperation and Development (OECD) and for which Screening Initial Data Set (SIDS) Initial Assessment Reports (SIAR) and SIDS Initial Assessment Profiles (SIAP) are available. These documents are presented in an international forum that involves review and endorsement by governmental authorities around the world. OPPT is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments.

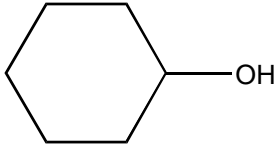
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<sup>1</sup> U.S. EPA. High Production Volume (HPV) Challenge Program; <http://www.epa.gov/chemrtk/index.htm>.

<sup>2</sup> U.S. EPA. HPV Challenge Program – Information Sources; <http://www.epa.gov/chemrtk/pubs/general/guidocs.htm>.

<sup>3</sup> U.S. EPA. Risk Assessment Guidelines; <http://cfpub.epa.gov/ncea/raf/rafguid.cfm>.

These hazard characterizations are technical documents intended to inform subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public.

|   |  |
|---|--|
| <b>Chemical Abstract Service Registry Number (CASRN)</b>  | <b>108-93-0</b>  |
| <b>Chemical Abstract Index Name</b>   | <b>Cyclohexanol</b>  |
| <b>Structural Formula</b>   |  |
| <b>Summary</b>  |  |
| <p>CASRN 108-93-0 is a solid at low temperatures and liquid at higher ambient temperatures. It has moderate vapor pressure and high water solubility. It is expected to possess high mobility in soil. Volatilization is considered moderate based on its Henry's Law constant. The rate of hydrolysis is negligible. The rate of atmospheric photooxidation is considered moderate. CASRN 108-93-0 is expected to have low persistence (P1) and low bioaccumulation potential (B1).</p> <p>The acute oral and inhalation toxicity of CASRN 108-93-0 in rats is low and moderate, respectively. The acute dermal toxicity of CASRN 108-93-0 in rabbits is moderate. In an inhalation combined repeated-dose/reproductive/developmental toxicity screening test with CASRN 108-93-0, mortality was seen in rats at 1.84 mg/L/day. At 10 weeks, the high exposure concentration was lowered to 1.64 mg/L/day for the remainder of the study; the NOAEC for systemic toxicity is 0.61 mg/L/day. During the reproductive/developmental toxicity phase, the only clinical signs of toxicity were prostration and decreased activity in a few animals at 1.64 mg/L/day. Decreased fetus viability and decreased mean pup body weights were observed at 1.64 mg/L/day; the NOAEC for reproductive toxicity is 0.61 mg/L/day. The NOAECs for maternal and developmental toxicity are 1.64 mg/L/day (highest concentration tested) and 0.61 mg/L/day, respectively. CASRN 108-93-0 did not induce gene mutations in bacteria <i>in vitro</i> nor micronuclei in mice <i>in vivo</i>. CASRN 108-93-0 is a respiratory tract and skin irritant in humans. CASRN 108-93-0 is irritating to rabbit skin and eyes and not a skin sensitizer in guinea pigs.</p> <p>The 96-h acute toxicity to fish for CASRN 108-93-0 is 704 mg/L. The 48-h acute toxicity to aquatic invertebrates for CASRN 108-93-0 is 17 mg/L and the 72-h toxicity to aquatic plants for CASRN 108-93-0 is 29.2 mg/L for growth rate.</p> <p>No data gaps were identified under the HPV Challenge Program.</p> |  |

The sponsor, Committee on HPV Challenge for Cyclohexanol, submitted a Test Plan and Robust Summaries to EPA for cyclohexanol (CASRN 108-93-0; 9<sup>th</sup> CI name: cyclohexanol) on October 3, 2001. EPA posted the submission on the ChemRTK HPV Challenge website on November 14, 2001

(<http://www.epa.gov/chemrtk/pubs/summaries/cyclohex/c13221tc.htm>). EPA comments on the original submission were posted to the website on April 23, 2002. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on June 24, 2002 and January 12, 2006, which were posted to the ChemRTK website on May 27, 2003 and March 21, 2006, respectively.

## 1. Chemical Identity

### 1.1 Identification and Purity

The following description is taken from the final Test Plan (2005):

CASRN 108-93-0 is an alcohol used primarily in the production of nylon intermediates (adipic acid and caprolactam); less than 2% is consumed in markets other than nylon. Other uses are in the production of lacquers, paints, varnishes, degreasers, plastics and plasticizers, soaps and detergents, textiles, and insecticides. The test substance percentages are 53.6 % cyclohexanol, 42.0 % cyclohexanone and 4.4% other.

### 1.2 Physical-Chemical Properties

The physical-chemical properties of cyclohexanol are summarized in Table 1. Cyclohexanol is a solid at low temperatures and liquid at higher ambient temperatures. It has moderate vapor pressure and high water solubility.

| <b>Property</b>                          | <b>Value</b>   |
|--|--|
| CASRN                                    | 108-93-0   |
| Molecular Weight                         | 100.16   |
| Physical State                           | Solid below 24°C and liquid at higher ambient temperatures                     |
| Melting Point                            | 24°C (measured)  |
| Boiling Point                            | 161.1°C (measured)   |
| Vapor Pressure                           | 1.0 mm Hg at 20°C (measured);<br>0.8 mm Hg at 25°C (measured) <sup>2</sup>     |
| Water Solubility                         | 36,000 mg/L at 20°C (measured);<br>42,000 mg/L at 10°C (measured) <sup>2</sup> |
| Dissociation Constant (pK <sub>a</sub> ) | Not applicable   |
| Henry's Law Constant                     | 4.4×10 <sup>-6</sup> atm·m <sup>3</sup> /mol (measured) <sup>2</sup>           |
| Log K <sub>ow</sub>                      | 1.25 (measured);<br>1.23 (measured) <sup>2</sup>                               |

**Table 1. Physical-Chemical Properties of Cyclohexanol<sup>1</sup>**

| Property | Value |
|----------|-------|
|----------|-------|

<sup>1</sup>Committee on HPV Challenge for Cyclohexanol. December 30, 2005. Revised Test Plan and Robust Summary for Cyclohexanol. Available online from: <http://www.epa.gov/chemrtk/pubs/summaries/cyclohex/c13221tc.htm> as of August 28, 2010.

<sup>2</sup>SRC. The Physical Properties Database (PHYSPROP). SRC: Syracuse, NY. Available online from: <http://www.syrres.com/esc/physprop.htm> as of August 28, 2010.

## **2. General Information on Exposure**

### **2.1 Production Volume and Use Pattern**

CASRN 108-93-0 had an aggregated production and/or import volume in the United States one billion pounds and greater during calendar year 2005.

Non-confidential information in the IUR indicated that the industrial processing and uses of the chemical include other basic organic chemical manufacturing as intermediates and solvents (which become part of product formulation or mixture). Non-confidential commercial and consumer uses of this chemical include paints and coatings; soaps and detergents; and not readily obtainable (NRO).

### **2.2 Environmental Exposure and Fate**

CASRN 108-93-0 is expected to possess high mobility in soil. CASRN 108-93-0 was biodegraded 98% after 6 days using a modified Zahn-Wellens test (OECD 302B) and was considered inherently biodegradable. In addition, it achieved 96% of its theoretical biochemical oxygen demand (BOD) using an activated sludge inoculum after a 28-day incubation period using the modified MITI test (OECD 301C) and was considered readily biodegradable. The rate of volatilization is considered moderate. The rate of hydrolysis is negligible. CASRN 108-93-0 is expected to have low persistence (P1) and low bioaccumulation potential (B1).

The environmental fate properties are provided in Table 2.

| <b>Property</b>                            | <b>Value</b>   |
|--|--|
| Photodegradation Half-life                 | 7.3 hours (estimated) <sup>2</sup>   |
| Hydrolysis Half-life                       | >1 year at pH 4,7, and 9   |
| Biodegradation                             | 98% after 6 days (inherently biodegradable);<br>96% after 28 days (readily biodegradable) <sup>3</sup> |
| Bioaccumulation Factor                     | BAF = 2.3 (estimated) <sup>2</sup>   |
| Log K <sub>oc</sub>                        | 1.0 (estimated) <sup>2</sup>   |
| Fugacity<br>(Level III Model) <sup>2</sup> |  |
| Air (%)                                    | 1.7  |
| Water (%)                                  | 39.0   |
| Soil (%)                                   | 59.2   |
| Sediment (%)                               | 0.1  |
| Persistence <sup>4</sup>                   | P1 (low)   |
| Bioaccumulation <sup>4</sup>               | B1 (low)   |

<sup>1</sup>Committee on HPV Challenge for Cyclohexanol. December 30, 2005. Revised Test Plan and Robust Summary for Cyclohexanol. Available online from: <http://www.epa.gov/chemrtk/pubs/summaries/cyclohex/c13221tc.htm> as of August 28, 2010.

<sup>2</sup>U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online from: <http://www.epa.gov/opptintr/exposure/pubs/episuitedi.htm> as of June 28, 2010.

<sup>3</sup>National Institute of Technology and Evaluation. 2002. Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law. Available online from: [http://www.safe.nite.go.jp/english/kizon/KIZON\\_start\\_hazkizon.html](http://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html) as of August 28, 2010.

<sup>4</sup>Federal Register. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

### **3. Human Health Hazard**

A summary of the human health toxicity data submitted for SIDS endpoint is provided in Table 3.

#### ***Acute Oral Toxicity***

Sprague-Dawley rats (2 – 3/sex/dose) were administered cyclohexanol via oral gavage at doses of 1000, 1260, 1580, 2000, 2510 or 3160 mg/kg and observed for 14 days following dosing. Mortality occurred at ≥ 1580 mg/kg and most deaths occurred within 48 hours of dose administration. Mortalities at each dose were not provided. No gross observations were noted in survivors.

**LD<sub>50</sub> = 1550 mg/kg**

#### ***Acute Dermal Toxicity***

New Zealand White rabbits (1 male or female rabbit/dose) were administered cyclohexanol (undiluted) via the dermal route at seven doses ranging from 316 to 5010 mg/kg to skin for 24

hours under unspecified conditions and observed for 14 days following dosing. All deaths occurred within 24 hours; no other information was provided on mortality.

**501 < LD<sub>50</sub> < 794 mg/kg**

### ***Acute Inhalation Toxicity***

Sprague-Dawley Albino Male rats and guinea pigs (six/species) were exposed to cyclohexanol via vapor inhalation at a concentration of 2.6 mg/L in a chamber for six hours and observed for 14 days. No mortalities or signs of toxicity occurred (TSCATS OTS0538617).

**LC<sub>50</sub> > 2.6 mg/L**

### ***Repeated-Dose Toxicity***

In a combined repeated-dose/reproductive/developmental toxicity screening test, Sprague-Dawley rats (15/sex/concentration) were administered cyclohexanol vapor via whole-body inhalation at 0, 50, 150 or 450 ppm (approximately 0, 0.21, 0.61 or 1.84 mg/L/day) 6 hours/day, 5 days/week for 13 weeks (females) or 16 weeks (males). The 450 ppm level was reduced to 400 ppm (approximately 1.64 mg/L/day) after ten weeks of exposure due to slight mortality (three males on days 37, 38 and 60 and one female [killed *in extremis*] on day 17).

Microscopically, the cause of these deaths could not be determined. However, because these deaths occurred at the highest concentration level, they were considered treatment-related.

Animals were examined for clinical signs of toxicity, body weight gain, food consumption and neurobehavioral observations [functional observational battery (FOB) and motor activity].

Urinalysis and analysis of blood for clinical chemistry and hematology were performed. Blood collections were conducted on 5 rats/sex/concentration after four weeks of exposure and at the four-week recovery period. Collections were also completed on 10 rats/sex/concentration after 13 weeks (females) and 16 weeks (males). Necropsies were conducted on all animals and selected tissues (not specified) were weighed and examined microscopically. Decreased activity and prostration were seen in animals of both sexes at the high test concentration of 400 ppm (~1.64 mg/L/day) immediately following exposure. No other treatment-related effects were observed.

**LOAEC ~ 1.84 mg/L/day** (based on mortality)

**NOAEC ~ 0.61 mg/L/day**

### ***Reproductive/Developmental Toxicity***

In the combined repeated-dose/reproductive/developmental toxicity screening test described above, cyclohexanol was administered to male and female rats via inhalation for 10 weeks pre-mating. After 10 weeks, females were continually exposed 6/hours/day, 7 days/week for 6 weeks (mating, gestation, postpartum, except for GDs 21 to Postpartum Day 3). Dams were allowed to deliver litters and maintain the pups until lactation day 4. Sperm motility and epididymal sperm counts were determined in all males. Testicular sperm counts and sperm morphology were determined in controls and high-dose males. In females, reproductive organs

were examined microscopically and gestation period, parturition difficulties, litter size and number of stillborn and live pups were determined. Pups were examined for sex, weight, abnormal behavior and external abnormalities. Testicular sperm counts were reduced at 400 ppm (1.64 mg/L/day) compared to controls, but were considered by the submitter to be comparable to historical controls for this rat strain (data not provided). Two of the eleven (18.2 %) pregnancies at 400 ppm (1.64 mg/L/day) resulted in no viable pups. Also at 400 ppm (1.64 mg/L/day), mean pup body weights were decreased at birth and at postnatal day 4. No other treatment-related effects were observed.

**LOAEC (reproductive toxicity) ~ 1.64 mg/L/day** (based on litter loss)

**NOAEC (reproductive toxicity) ~ 0.61 mg/L/day**

**NOAEC (maternal toxicity) ~ 1.64 mg/L/day** (highest concentration tested)

**LOAEC (developmental toxicity) ~ 1.64 mg/L/day** (based on mortality and decreased pup body weight)

**NOAEC (developmental toxicity) ~ 0.61 mg/L/day**

### ***Genetic Toxicity – Gene Mutation***

#### ***In vitro***

(1) *Salmonella typhimurium* strains TA98, TA1535, TA1537 and TA1538 were exposed to cyclohexanol at concentrations of 500 – 10,000 µg/plate (2 replicates) in the absence of metabolic activation and 500 – 15,000 µg/plate (2 replicates) in the presence of metabolic activation. The cytotoxic concentration was 7500 µg/plate in the presence and absence of metabolic activation. Both positive and negative controls were used in the study, but control responses were not presented.

**Cyclohexanol was not mutagenic in this assay.**

(2) In a NTP study, *S. typhimurium* strains TA98, TA100, TA1535 and TA1537 were exposed to 10 % cyclohexanol at 0, 33, 100, 333, 1000 and 3333 µg/plate in the presence and absence of metabolic activation. Positive controls responded accordingly. Cyclohexanol was found to be negative for induction of genetic mutations in *Salmonella*. [http://ntp-apps.niehs.nih.gov/ntp\\_tox/index.cfm?fuseaction=salmonella.overallresults&cas\\_no=108-93-0&endpointlist=SA](http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm?fuseaction=salmonella.overallresults&cas_no=108-93-0&endpointlist=SA)

**Cyclohexanol was not mutagenic in this assay.**

### ***Genetic Toxicity – Chromosomal Aberrations***

#### ***In vivo***

In a micronucleus assay, NMRI mice (5/sex/dose) were administered a single dose of cyclohexanol (98% purity) via oral gavage at 0, 500, 1000 and 1500 mg/kg/day. Animals were sacrificed after 24 hours (500 and 1000 mg/kg groups); or at 16, 24, and 48 hours (1500 mg/kg group). The test substance was suspended in 0.5% carboxymethyl cellulose (CMC) formulation and given to each animal at a volume of 10 mL/kg. Positive and negative controls were tested concurrently (control animals were only sacrificed at the 24 hour pos-exposure time point).

Animals were sacrificed 16, 24 or 48 hours after dosing and the number of micronuclei/1000 polychromatic erythrocytes was counted (2000 cells counted).

**Cyclohexanol did not induce micronuclei in mice in this assay.**

### ***Additional Information***

#### ***Eye Irritation***

(1) New Zealand Albino rabbits (6, sex not specified) were administered a single dose of 0.1mL cyclohexanol undiluted in the eye for 24 hours. The cornea, iris and conjunctiva were observed at 10 minutes, 1, 24, 48 and 168 hours (TSCATS OTS0538617).

**Cyclohexanol was moderately irritating in this study.**

(2) New Zealand Albino rabbits (2/sex not specified) were administered a single dose of 0.1 mL cyclohexanol in the right conjunctival sac. After 20 seconds, one exposed eye was washed with tap water for one minute while the other was not washed. The cornea, iris, and conjunctiva were observed at one and four hours then again at 1, 2, 3, 7 and 14 days after treatment (TSCATS OTS0558282).

**Cyclohexanol was mildly irritating in this study.**

#### ***Skin Irritation***

(1) In three separate studies, New Zealand Albino rabbits (6, sex not specified) were administered a single dose of 0.5 mL of undiluted cyclohexanol on the skin (not specified) for 24 hours. Observations were made at 4, 24, 48, 72 and 168 hours after treatment (TSCATS OTS0538617, OTS0558282, OTS0572833).

**Cyclohexanol was mild to moderately irritating in this study.**

(2) In a 48-hour closed patch test using 4% cyclohexanol in petrolatum, there was evidence of erythema or edema in human subjects (*American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6<sup>th</sup> ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 358. Rowe, V.K.; McCollister, S.B, 1982*).

**Cyclohexanol was irritating to human skin in this study.**

#### ***Respiratory Tract Irritation***

Ten human subjects of mixed sexes participated in the study where they were administered various concentrations of solvent cyclohexanol vapor ( $\leq 100$  ppm) for 3-5 minutes. The investigator assumed that the estimated acceptable concentration in air for 8-hours was less than 100 ppm. No person was actually exposed to any of the test concentrations for 8 hours. The cyclohexanol concentration that was most irritating to the eyes, nose and throat was 100 ppm and was declared objectionable by the subjects (*American Conference of Governmental Industrial Hygienists, Inc., 1991; Nelson, K.W.; Ege, J.F.; Ross, M.; et al, 1943*).

**Cyclohexanol was irritating to the respiratory tract in this study.**

### ***Sensitization***

Guinea pigs (20/dose, sex and strain not specified) were administered a single intradermal injection of cyclohexanol and observed for 48 hours. Animals (10/dose, sex and strain not specified) were challenged twice (Group 1 and Group 2) with 25% cyclohexanol in olive oil (DAB 8) and olive oil alone (DAB 9). No skin irritations were observed in either group treated with DAB 8 or in the test animals. Animals treated with DAB 9 showed no treatment related effects after the first and second challenge.

**Cyclohexanol was not a skin sensitizer in guinea pigs in this study.**

**Conclusion:** The acute oral and inhalation toxicity of CASRN 108-93-0 in rats is low and moderate, respectively. The acute dermal toxicity of CASRN 108-93-0 in rabbits is moderate. In an inhalation combined repeated-dose/reproductive/developmental toxicity screening test with CASRN 108-93-0, mortality was seen in rats at 1.84 mg/L/day. At 10 weeks, the high exposure concentration was lowered to 1.64 mg/L/day for the remainder of the study; the NOAEC for systemic toxicity is 0.61 mg/L/day. During the reproductive/developmental toxicity phase, the only clinical signs of toxicity were prostration and decreased activity in a few animals at 1.64 mg/L/day. Decreased fetus viability and decreased mean pup body weights were observed at 1.64 mg/L/day; the NOAEC for reproductive toxicity is 0.61 mg/L/day. The NOAECs for maternal and developmental toxicity are 1.64 mg/L/day (highest concentration tested) and 0.61 mg/L/day, respectively. CASRN 108-93-0 did not induce gene mutations in bacteria *in vitro* nor micronuclei in mice *in vivo*. CASRN 108-93-0 is a respiratory tract and skin irritant in humans. CASRN 108-93-0 is irritating to rabbit skin and eyes and not a skin sensitizer in guinea pigs.

| <b>Table 3. Summary Table of the Screening Information Data Set<br/>as Submitted under the U.S. HPV Challenge Program –<br/>Human Health Data</b>        |  |
|--|--|
| <b>Endpoints</b>   | <b>SPONSORED CHEMICAL<br/>Cyclohexanol<br/>(108-93-0)</b>  |
| <b>Acute Oral Toxicity<br/>LD<sub>50</sub> (mg/kg)</b>   | <b>1550</b>  |
| <b>Acute Dermal Toxicity<br/>LD<sub>50</sub> (mg/kg)</b>   | <b>&gt; 501 to &lt; 794</b>  |
| <b>Acute Inhalation Toxicity<br/>LC<sub>50</sub> (mg/L)</b>  | <b>&gt; 2.6</b>  |
| <b>Repeated-Dose Toxicity<br/>NOAEC/LOAEC<br/>Inhalation (mg/L/day)</b>  | <b>NOAEC ~ 0.61<br/>LOAEC ~ 1.84</b>   |
| <b>Reproductive Toxicity<br/>NOAEC/LOAEC<br/>Inhalation (mg/L/day)</b><br><br><b>Reproductive Toxicity</b>   | <b>NOAEC ~ 0.61<br/>LOAEC ~ 1.64</b>   |
| <b>Developmental Toxicity<br/>NOAEC/LOAEC<br/>Inhalation (mg/L/day)</b><br><br><b>Maternal Toxicity</b><br><br><b>Developmental Toxicity</b>             | <b>NOAEC ~ 1.64<br/>(highest concentration tested)</b><br><br><b>NOAEC ~ 0.61<br/>LOAEC ~ 1.64</b>   |
| <b>Genetic Toxicity – Gene Mutation<br/><i>In vitro</i></b>  | <b>Negative</b>  |
| <b>Genetic Toxicity – Chromosomal Aberrations<br/><i>In vivo</i></b>   | <b>Negative</b>  |
| <b>Additional Information</b><br><br><b>Eye Irritation</b><br><b>Skin Irritation</b><br><b>Respiratory Tract Irritation</b><br><b>Skin Sensitisation</b> | <b>Moderately Irritating</b><br><b>Moderately Irritating</b><br><b>Irritating</b><br><b>Negative</b> |

#### 4. Hazard to the Environment

A summary of aquatic toxicity data submitted for SIDS endpoints is provided in Table 4.

##### *Acute Toxicity to Fish*

Fathead minnows (*Pimephales promelas*) were exposed to CASRN 108-93-0 at nominal concentrations of 0, 133, 222, 369, 616 or 1026 mg/L under flow-through conditions for 96 hours. The corresponding measured concentrations were < 0.7, 120, 183, 304, 532 and 942 mg/L. At 96 hours, 100% mortality was observed at the highest concentration tested; no mortality was seen at the other test concentrations.

**96-h LC<sub>50</sub> = 704 mg/L**

##### *Acute Toxicity to Aquatic Invertebrates*

*Daphnia magna* were exposed to CASRN 108-93-0 at nominal concentrations of 0, 1.0, 1.8, 3.2, 5.6, 10, 18, 32, 56 or 100 mg/L under semi-static conditions for 48 hours. Analytically measured concentrations were reported to range from 49 to 105% of nominal at 24 and 48 hours. Mortality rates were not reported.

**48-h EC<sub>50</sub> = 17 mg/L**

##### *Toxicity to Aquatic Plants*

Green algae (*Scenedesmus subspicatus*) were exposed to CASRN 108-93-0 at unspecified concentrations under static conditions for 72 hours.

**72-h EC<sub>50</sub> (growth rate) = 29.2 mg/L**

**Conclusion:** The 96-h acute toxicity to fish for CASRN 108-93-0 is 704 mg/L. The 48-h acute toxicity to aquatic invertebrates for CASRN 108-93-0 is 17 mg/L and the 72-h toxicity to aquatic plants for CASRN 108-93-0 is 29.2 mg/L for growth rate.

| <b>Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Aquatic Toxicity Data</b> |   |
|---|---|
| <b>Endpoint</b>   | <b>SPONSORED CHEMICAL<br/>Cyclohexanol (108-93-0)</b> |
| <b>Fish</b>   |   |
| <b>96-h LC<sub>50</sub> (mg/L)</b>  | <b>704</b>  |
| <b>Aquatic Invertebrates</b>  |   |
| <b>48-h EC<sub>50</sub> (mg/L)</b>  | <b>17</b>   |
| <b>Aquatic Plants</b>   |   |
| <b>72-h EC<sub>50</sub> (mg/L)<br/>(biomass)</b>  | <b>-</b>  |
| <b>(growth rate)</b>  | <b>29.2</b>   |

**bold** = measured data (i.e., derived from testing); - indicates that endpoint was not addressed for this chemical.

## 5. **References**

1. American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 358 \*\*PEER REVIEWED\*\*
2. Nelson, K.W.; Ege, J.F.; Ross, M.; et al.: Sensory Response to Certain Industrial Vapors. J Ind Hyg Toxicol 25:282-285, 1943. Published article was available for review.
3. Rowe, V.K.; McCollister, S.B.: Alcohols. In: Patty's Industrial Hygiene and Toxicology, 3rd Rev.ed., Vol. 2C, Toxicology, pp. 4643-4649. G.D. Clayton and F.E. Clayton, Eds. John Wiley & Sons, New York (1982). Published article was available for review.