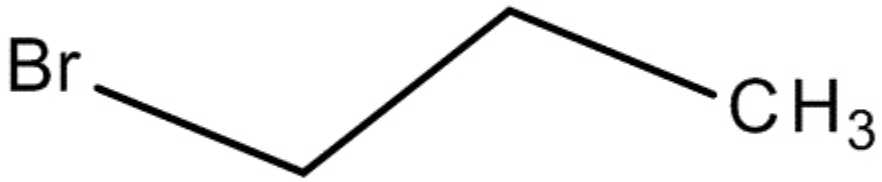
United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Draft Risk Evaluation for 1-Bromopropane (n-Propyl Bromide)

1-BP Supplemental File: ECHA Study Summaries for Environmental Hazard

CASRN: 106-94-5



July, 2019

Included in this document are copies of the five study summaries used in part to characterize the environmental hazards of 1-BP. These studies characterize the environmental hazards following acute exposures to fish, aquatic invertebrates, algae and activated sludge. These files were downloaded from the European Chemicals Agency (ECH)A registration dossier for 1-BP on April 23, 2019 from the following website:

https://echa.europa.eu/registration-dossier/-/registered-dossier/15004

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REACH

1-bromopropane

EC number: 203-445-0 | CAS number: 106-94-5

Ecotoxicological information

Short-term toxicity to fish

003 Key | Experimental result

Administrative data

Endpoint:	short-term toxicity to fish
Type of information:	experimental study
Adequacy of study:	key study
Study period:	28th May - 8th September 2008
Reliability:	1 (reliable without restriction)
Rationale for reliability incl. deficiencies:	other: Study conducted in compliance with agreed protocols, with no or minor deviations from standard test guidelines and/or minor methodological deficiencies, which do not affect the quality of the relevant results.

Data source

Reference

Reference Type:	study report
Title:	Unnamed
Year:	2009
Report Date:	2009

Materials and methods

Test guideline

Test guideline 1

Qualifier:	according to
Guideline:	OECD Guideline 203 (Fish, Acute Toxicity Test)
Deviations:	no

Test guideline 2

Qualifier:	according to
Guideline:	EU Method C.1 (Acute Toxicity for Fish)
Deviations:	no

GLP compliance: yes (incl. certificate)

Test material

Reference

Name:	Unnamed
Type:	Constituent
Details on test material:	Purity is 99.91 %

Specific details on test material used for the study: Details on properties of test surrogate or analogue material (migrated information):
N/A

Sampling and analysis

Analytical monitoring: yes

Details on sampling:
- Concentrations: 1.0, 4.27, 9.39, 20.7, 45.5 and 100 mg/L
- Sampling method: Samples of control and test media from the test were analysed in suitably sized batches along with control samples fortified with n-BP which acted as procedural recovery samples. Fresh and/or expired samples were taken at 0, 24, 48, 72 and 96 hours.
- Sample storage conditions before analysis: NDA

Test solutions

Vehicle: no

Details on test solutions: The method of preparation used during the definitive test was based on the results of the range finding test and formulation trials.

On Days 0 and 2 of the test, the test substance (7680, 3490, 1590, 722, 328 or 76.8 µl) was added to a glass aspirator completely filled with diluent water (22.4 L); each aspirator was sealed leaving no headspace. To aid dissolution, the contents of each aspirator were stirred vigorously for two hours. Aliquots (11.2 l) of the appropriate stock solution were then poured into duplicate test vessels (total capacity 50 litre glass aquaria) and the test vessels filled to capacity with diluent water and sealed using a Perspex cover

Test organisms

Test organisms (species): Oncorhynchus mykiss (previous name: Salmo gairdneri)

Details on test organisms: TEST ORGANISM
- Common name: Rainbow trout
- Strain: Oncorhynchus mykiss
- Source: a commercial fish farm in the UK
- Age at study initiation (mean and range, SD): NDA

- Length at study initiation (length definition, mean, range and SD):
- Weight at study initiation (mean and range, SD): mean weight 2.23 g
- Method of breeding: reared on a farm where the eggs had hatched
- Feeding during test: None
- Food type:N/A
- Amount: N/A
- Frequency: N/A

ACCLIMATION
- Acclimation period: 14 days
- Acclimation conditions (same as test or not): yes
- Type and amount of food: Fish were given daily commercial fish food (TROUW (UK) Ltd; Nutra Fry 02) equivalent to between 1 and 2% of the total wet-weight of fish in the holding tank
- Feeding frequency: daily except for period 48 hours prior to exposure
- Health during acclimation (any mortality observed): 2.0 % mortality

Study design

Test type:	semi-static
Water media type:	freshwater
Limit test:	no
Total exposure duration:	96 h
Post exposure observation period:	None

Test conditions

Hardness:	The total hardness of the dilution water measured in the one replicate control vessel was 152 mg/L as CaCO3. The total hardness of the test media measured in one replicate vessel at nominal 100 mg/L concentration was 156 mg/L as CaCO3.
Test temperature:	13.6 - 14.9 ºC
pH:	7.51 - 8.02
Dissolved oxygen:	72 - 101 % ASF (air saturation value)
Salinity:	NDA
Nominal and measured concentrations:	Nominal concentrations of 1.0, 4.27, 9.39, 20.7, 45.5 and 100 mg/L. Based on a geometric mean, the overall measured concentrations of n-BP were 0.5 (estimated), 1.77, 7.12, 18.4, 40.6 and 82.7 mg/L.
Details on test conditions:	TEST SYSTEM - Test vessel: Glass aquaria - Type (delete if not applicable): closed - Material, size, headspace, fill volume: 50 L volume containing 50 L of media - Aeration: None - Type of flow-through (e.g. peristaltic or proportional diluter): N/A - Renewal rate of test solution (frequency/flow rate): 24 hours - No. of organisms per vessel: 10 - No. of vessels per concentration (replicates): 2 - No. of vessels per control (replicates): 2 - No. of vessels per vehicle control (replicates): N/A - Biomass loading rate: 0.45 g bodyweight/L TEST MEDIUM / WATER PARAMETERS The water used to hold the fish and for the study was laboratory tap water, dechlorinated and softened by passage through a water purification system. It was passed through a high grade activated carbon filter to remove chlorine and any organic contaminants. A proportion of the supply then passed through a water softener before final reverse osmosis treatment to produce a highly purified water supply. The two grades of dechlorinated water were then remixed to give a

supply with the desired water hardness. This water was then held in an intermediate tank where it was equilibrated to the test temperature and gently aerated before being supplied to the holding and test areas.

OTHER TEST CONDITIONS
- Adjustment of pH: Not adjusted.
- Photoperiod:16 hours light, 8 hours dark.
- Light intensity: 126 - 227 lux

EFFECT PARAMETERS MEASURED (with observation intervals if applicable) : The criteria of death employed in this study were (i) absence of respiratory movement and (ii) absence of response to physical stimulation of the caudal peduncle.
In addition to observations on mortality, at approximately 3, 6, 24, 48, 72 and 96 hours, subjective assessments were also made on the incidence and type of any sub-lethal effects compared with control fish.

TEST CONCENTRATIONS
- Spacing factor for test concentrations: ca. 2.2
- Justification for using less concentrations than requested by guideline: N/A
- Range finding study
- Test concentrations: 1, 10, 100 and 1000 mg/L
- Results used to determine the conditions for the definitive study: After approximately 15 minutes of exposure, all of the fish at 1000 mg/L had died. After 96 hours of exposure, there was no mortality or sub-lethal effects observed at 1 mg/L; 33% mortality was observed at 10 mg/L and 100% mortality was observed at 100 mg/L

Reference substance (positive control):	no

Results and discussion

Effect concentrations

Effect concentrations 1

Duration:	24 h
Dose descriptor:	LC50
Effect conc.:	94.3 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mortality
Remarks on result:	other: 95 % CL of 82.2 - 178

Effect concentrations 2

Duration:	48 h
Dose descriptor:	LC50
Effect conc.:	41.1 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mortality
Remarks on result:	other: 95 % CL of 30.4 - 58.2

Effect concentrations 3

Duration:	72 h
Dose descriptor:	LC50
Effect conc.:	30.5 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mortality
Remarks on result:	other: 95 % CL of 21.9 - 43.3

Effect concentrations 4

Duration:	96 h
Dose descriptor:	LC50
Effect conc.:	24.3 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mortality
Remarks on result:	other: 95 % CL of 17.7 - 33.3

Effect concentrations 5

Duration:	96 h
Dose descriptor:	NOEC
Effect conc.:	1.77 mg/L
Nominal / measured:	meas. (arithm. mean)
Conc. based on:	test mat.
Basis for effect:	mortality

Details on results:	- Behavioural abnormalities: Effects included lethargy (fish at base of test vessel), darkened pigmentation (body and/or eye orbits), loss of orientation (nose upwards), surface swimming, overturned but mobile, overturned and immobile at base of test vessel, hyperventilation and pale faeces with excessive mucus. These effects were dose dependant. - Observations on body length and weight: NDA - Other biological observations: NDA - Mortality of control: None - Other adverse effects control: None - Abnormal responses: None
Results with reference substance (positive control):	N/A
Reported statistics and error estimates:	

LC50 values were calculated using the SAFEStat LD50 application (SAS 8.2.) and the overall mean measured concentrations of n-BP.

The “no observed effect concentration” (NOEC) was derived by direct inspection of the data for lethal and treatment-related-effects.

Applicant's summary and conclusion

Validity criteria fulfilled:	yes
Remarks:	all OECD 203 validity criteria were met.
Conclusions:	The 96-hour LC50 value for n-BP with rainbow trout was 24.3 mg/L, with 95% confidence limits of 17.7 and 33.3 mg/L. The no observed effect concentration was 1.77 mg/L.
Executive summary:	In an acute toxicity to fish study (TSH0095), Oncorhynchus mykiss were exposed to 1-bromopropane for 96 hours under semi-static conditions in a sealed environment to prevent the volatile test substance from escaping. The 96-hour LC50 value for n-BP with rainbow trout was 24.3 mg/L, with 95% confidence limits of 17.7 and 33.3 mg/L. The no observed effect concentration was 1.77 mg/L.

REACH

1-bromopropane

EC number: 203-445-0 | CAS number: 106-94-5

Ecotoxicological information

Short-term toxicity to aquatic invertebrates

002 Key | Experimental result

Administrative data

Endpoint:	short-term toxicity to aquatic invertebrates
Type of information:	experimental study
Adequacy of study:	key study
Study period:	24th April - 19th September 2008
Reliability:	1 (reliable without restriction)
Rationale for reliability incl. deficiencies:	other: Study conducted in compliance with agreed protocols, with no or minor deviations from standard test guidelines and/or minor methodological deficiencies, which do not affect the quality of the relevant results.

Data source

Reference

Reference Type:	study report
Title:	Unnamed
Year:	2009
Report Date:	2009

Materials and methods

Test guideline

Qualifier:	according to
Guideline:	OECD Guideline 202 (Daphnia sp. Acute Immobilisation Test)
Deviations:	no

Principles of method if other than guideline:	To minimise losses of the test substance due to its volatile nature, individual vessels were established at each test concentration for analysis after 48 hours. This deviates from the protocol, which states that samples for analysis will be removed from each replicate vessel.
GLP compliance:	yes (incl. certificate)

Test material

Type:	Constituent
Details on test material:	Purity is 99.91 %

Specific details on test material used for the study:

Details on properties of test surrogate or analogue material (migrated information):
N/A

Sampling and analysis

Analytical monitoring:	yes
Details on sampling:	- Concentrations: 3.13, 6.25, 12.5, 25 and 50 mg/kg - Sampling method and storage conditions: At the start of the definitive test, four samples (ca 35 ml) were taken from the freshly prepared control and test media. Samples were placed into vessels that were completely filled and sealed, leaving no headspace. Individual vessels were established at the beginning of the study and maintained under test conditions for analysis after 48 hours. At the start of the test, two of the samples were analysed at each concentration. After 48 hours, a sample was analysed from specified vessels. All remaining samples were stored in a refrigerator in case further analysis was required. This was necessary at a nominal concentration of 3.13 mg/l at the start of the test due to erroneously high measured results. The results of the reserve samples have been used for calculating mean measured concentrations.

Test solutions

Vehicle:	no
Details on test solutions:	The method of preparation used during the definitive test was based on the results of range finding tests and formulation trials. At 12.5 to 50 mg/L, the test media were prepared from aqueous dilutions in which the test substance (21.5, 21.3 or 42.5 µL) was added directly to dilution medium (2330, 1150 and 1150 mL respectively) in a sealed glass bottle. To aid dissolution, the contents of the flasks were vigorously stirred for 2 hours. At 3.13 and 6.25 mg/L, the medium was prepared by serial dilution from the aqueous preparation at 12.5 mg/L

Test organisms

Test organisms (species):	Daphnia magna
Details on test organisms:	TEST ORGANISM - Common name: freshwater flea - Strain: Daphnia magna (straus) - Source: National Institute for Applied Chemical Research (IRCHA), France. - Age at study initiation (mean and range, SD): Juvenile, less than 24 hours. - Weight at study initiation (mean and range, SD): NDA - Length at study initiation (length definition, mean, range and SD): NDA - Valve height at study initiation, for shell deposition study (mean and range, SD): NDA - Peripheral shell growth removed prior to test initiation: NDA - Method of breeding: cultured in house - Feeding during test: NDA ACCLIMATION - Acclimation period: NDA - Acclimation conditions (same as test or not): No due to volatility of test substance. - Type and amount of food: unicellular green algae, Pseudokirchneriella subcapitata. 0.1 to 0.2 mg carbon per daphnid, per day, except during the initial three days when a slightly lower ration was given. - Feeing frequency: Daily. - Health during acclimation (any mortality observed): NDA

Study design

Test type:	static
Water media type:	freshwater
Limit test:	no
Total exposure duration:	48 h
Post exposure observation period:	N/A

Test conditions

Hardness:	152 mg/L
Test temperature:	20.4 - 21.2 ºC
pH:	Control = 7.43 Test vessels = 8.06 - 8.31
Dissolved oxygen:	98 - 100 % of air saturation value
Salinity:	NDA
Nominal and measured concentrations:	Nominal concentrations. 3.13, 6.25, 12.5, 25 and 50 mg/L Mean measured concentrations: 5.22, 6.24, 13.2, 29.6, 58.8 mg/L
Details on test conditions:	TEST SYSTEM - Test vessel: Glass bottles - Type (delete if not applicable): closed - Material, size, headspace, fill volume: completely filled vessels. - Aeration: No - Type of flow-through (e.g. peristaltic or proportional diluter): N/A - Renewal rate of test solution (frequency/flow rate): N/A - No. of organisms per vessel: 5 - No. of vessels per concentration (replicates): 4 - No. of vessels per control (replicates): 4 - No. of vessels per vehicle control (replicates): N/A - Biomass loading rate: 20 ml per organism TEST MEDIUM / WATER PARAMETERS Softened Elendt M4 medium OTHER TEST CONDITIONS - Adjustment of pH: No - Photoperiod: 16 hours light, 8 hours dark. - Light intensity: NDA EFFECT PARAMETERS MEASURED (with observation intervals if applicable) : Daphnia were considered to be immobile if they were unable to swim within approximately 15 seconds following gentle agitation of the test vessel. The numbers of mobile, immobile and floating Daphnia were counted approximately 24 and 48 hours after the start of the study. TEST CONCENTRATIONS - Spacing factor for test concentrations: 2 - Justification for using less concentrations than requested by guideline: N/A - Range finding study - Test concentrations: 1, 10, 100 and 1000 mg/L - Results used to determine the conditions for the definitive study: 10 and 100 mg/L
Reference substance (positive control):	yes
Remarks:	potassium dichromate

Results and discussion

Effect concentrations

Effect concentrations 1

Duration:	24 h
Dose descriptor:	EC50
Effect conc.:	203 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mobility
Remarks on result:	other: 95% CL: unavailable

Effect concentrations 2

Duration:	48 h
Dose descriptor:	EC50
Effect conc.:	99.3 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mobility
Remarks on result:	other: 95% CL: unavailable

Effect concentrations 3

Duration:	48 h
Dose descriptor:	NOEC
Effect conc.:	29.6 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	mobility

Details on results:	- Behavioural abnormalities: Lethargy of Daphnia at highest concentration - Observations on body length and weight: NDA - Other biological observations: NDA - Mortality of control: None - Other adverse effects control: None - Abnormal responses: None - Any observations (e.g. precipitation) that might cause a difference between measured and nominal values: NDA - Effect concentrations exceeding solubility of substance in test medium: No
Results with reference substance (positive control):	The sensitivity of juvenile Daphnia cultured in the laboratory is periodically assessed using the reference substance potassium dichromate. The results for the most recent test performed prior to this study indicated that its 48-hour EC50 to Daphnia magna was 0.53 mg/L. This was within the range typically obtained in this laboratory (0.3 to 0.8 mg/L).
Reported statistics and error estimates:	The measured levels of n-BP in samples of the test media ranged between 85 and 125% of their nominal values, except at 3.13 mg/L, where a formulation error resulted in measured levels of 154 to 177% of nominal. These results gave overall mean measured levels of 5.22, 6.24, 13.2, 29.6 and 58.8 mg/L and these values have been used in the calculation of test results.

Any other information on results incl. tables

Table 1: Cumulative Immobilisation

Exposure concentrations mg n-BP/L		Cumulative numbers of immobile Daphnia										
		24 hours						48 hours				
Nominal	Measured	R_1	R_2	R_3	R_4	total	%	R_1	R_2	R_3	R_4	total
Control	N/A	0	0	0	0	0	0	0	0	0	0	0
3.13	5.22	0	0	0	0	0	0	0	0	0	1	1
6.25	6.24	0	0	0	0	0	0	0	0	0	0	0
12.5	13.2	0	0	0	0	0	0	0	0	0	0	0
25	29.6	0	0	0	0	0	0	0	0	0	0	0
50	58.8	0	1	1	0	2	10	0[a]	2[a]	3[a]	2[a]	7

R = Replicate number

a = all remaining Daphnia observed to be lethargic but still mobile on agitation.

Applicant's summary and conclusion

Validity criteria fulfilled:	yes
Conclusions:	The 48-hour EC50 of n-BP for the immobilisation of Daphnia magna was estimated to be 99.3 mg/L. The 'no-observed effect concentration' of n-BP with Daphnia magna was 29.6 mg/L.
Executive summary:	The 48 hr-acute toxicity of 1-bromopropane to Daphnia magna was studied under static conditions. Daphnids were exposed to 1 -bromopropane dissolved in Elendt M4 medium at mean measured concentrations of 0, 5.22, 6.24, 13.2, 29.6 and 58.8 mg/L for 48 hours. The 48 hour EC50 based on immobility was 99.3 mg/L. The 48 hr NOEC value based on immobility was 29.6 mg/L. No 95% confidence intervals could be determined.

REACH

1-bromopropane

EC number: 203-445-0 | CAS number: 106-94-5

Ecotoxicological information

Toxicity to aquatic algae and cyanobacteria

002 Key | Experimental result

Administrative data

Endpoint:	toxicity to aquatic algae and cyanobacteria
Type of information:	experimental study
Adequacy of study:	key study
Study period:	25th April - 5th October 2008
Reliability:	1 (reliable without restriction)
Rationale for reliability incl. deficiencies:	other: Study conducted in compliance with agreed protocols, with no or minor deviations from standard test guidelines and/or minor methodological deficiencies, which do not affect the quality of the relevant results.

Data source

Reference

Reference Type:	study report
Title:	Unnamed
Year:	2009
Report Date:	2009

Materials and methods

Test guideline

Test guideline 1

Qualifier:	according to
Guideline:	EU Method C.3 (Algal Inhibition test)
Deviations:	no

Test guideline 2

Qualifier:	according to
Guideline:	OECD Guideline 201 (Alga, Growth Inhibition Test)
Deviations:	no

Test guideline 3

Qualifier:	according to
Guideline:	EPA OPPTS 850.5400 (Algal Toxicity, Tiers I and II)
Deviations:	not specified

GLP compliance: yes (incl. certificate)

Test material

Reference

Name:	Unnamed
Type:	Constituent
Details on test material:	Purity is 99.91 %

Specific details on test material used for the study: Details on properties of test surrogate or analogue material (migrated information):
N/A

Sampling and analysis

Analytical monitoring: yes

Details on sampling:

- Concentrations: 15.6, 31.3, 62.5, 125, 250 and 500 mg/L
- Sampling method and sample storage: At the start of the definitive test, two samples (ca. 35 mL) were taken from the freshly-prepared control and test media. Samples were placed into vessels that were completely filled and sealed, leaving no headspace. Individual vessels were established at the beginning of the study and maintained under test conditions for analysis after 96 hours. Additional flasks containing n-BP at 15.6 and 500 mg/L but with no algal cells were incubated and analysed after 96 hours, in order to obtain information on the extent of adsorption/absorption of the test substance by the algal cells.

At the start of the test, one sample was analysed and the other was stored in a refrigerator in case further analysis was required. After 96 hours, a sample was analysed from a designated test vessel at each concentration.

Test solutions

Vehicle: no

Details on test solutions: PREPARATION AND APPLICATION OF TEST SOLUTION (especially for difficult test substances)

At 62.5 to 500 mg/L, the test media were prepared from aqueous dilutions in which the test substance (108, 106, 213 or 425 µL) was added directly to dilution medium (2330, 1150, 1150 and 1150 mL respectively) in a sealed glass bottle. To aid dissolution, the contents of the flasks were vigorously stirred for 2 hours. At 15.6 and 31.3 mg/L, the medium was prepared by serial dilution from the aqueous preparation at 62.5 mg/L.

An aliquot (10.6 mL) of the secondary algal inoculum was added to a portion (1000 mL) of the test medium at each concentration, to give an initial cell density of 1 x 10^4 cells/mL. An aliquot (ca. 65 mL) of the appropriate inoculated test medium was added to each of the test vessels so they were completely filled with no headspace, and were then sealed.

Test organisms

Test organisms (species):	Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
Details on test organisms:	TEST ORGANISM - Common name: Green algae - Strain: Pseudokirchneriella subcapitata, Strain No. CCAP 278/4. - Source (laboratory, culture collection): Culture Collection of Algae and Protozoa (CCAP), SAMS Research Services Ltd., Dunstaffnage Marine Laboratory, Dunbeg, Oban, Argyll, Scotland - Age of inoculum (at test initiation): NDA - Method of cultivation: The liquid slope cultures were stored in an illuminated refrigerator. Sterile algal nutrient medium was inoculated with cells aseptically removed from the slope culture; these primary liquid cultures (100 mL) were incubated for approximately three days in an orbital incubator under continuous illumination at nominal temperatures in the range 21 to 25°C. Subsequently, appropriate volumes of these primary cultures were aseptically transferred to fresh sterile algal nutrient medium to prepare secondary liquid cultures; these cultures were incubated, as stated above, for a further three days to provide an inoculum in the exponential phase of growth, characterised by a cell density of 9.41 x 10^5 cells/mL. ACCLIMATION N/A

Study design

Test type:	static
Water media type:	freshwater
Limit test:	no
Total exposure duration:	96 h
Post exposure observation period:	N/A

Test conditions

Hardness:	NDA
Test temperature:	At 0 hours: 23.1 - 24.0 ºC At 96 hours: 22.0 - 22.8 ºC
pH:	At 0 hours: 7.11 - 7.53 At 96 hours: 6.88 - 9.65 The pH for the 96 hour vessels decreased with increasing concentration of test substance.
Dissolved oxygen:	NDA
Salinity:	NDA
Nominal and measured concentrations:	

	Nominal: 15.6, 31.3, 62.5, 125, 250 and 500 mg/L. Mean measured: 7.66, 12.4, 48.4, 105, 205 and 447 mg/L
Details on test conditions:	TEST SYSTEM - Test vessel: Wheaton vials - Type (delete if not applicable): closed - Material, size, headspace, fill volume: 65 mL flasks with 65 mL test media - Aeration: No - Type of flow-through (e.g. peristaltic or proportional diluter): N/A - Renewal rate of test solution (frequency/flow rate): Not renewed - Initial cells density: 10,000 cells/mL - Control end cells density: 1,051,503 cells/mL - No. of organisms per vessel: 65,000 cells - No. of vessels per concentration (replicates): 3 - No. of vessels per control (replicates): 6 - No. of vessels per vehicle control (replicates): N/A GROWTH MEDIUM - Standard medium used: yes - Detailed composition if non-standard medium was used: N/A TEST MEDIUM / WATER PARAMETERS OECD medium OTHER TEST CONDITIONS - Sterile test conditions: yes - Adjustment of pH: adjusted to approximately 7 - Photoperiod: Continuous - Light intensity and quality: approximately 4056 to 4444 lux (mean values) provided by 6 x 30 W “cool white” 1 metre fluorescent tubes at an intensity setting of 45%. - Salinity (for marine algae): N/A EFFECT PARAMETERS MEASURED (with observation intervals if applicable) : - Determination of cell concentrations: Cell densities measured using a Coulter Z Series Particle Count and Size Analyser - Chlorophyll measurement: N/A - Other: N/A TEST CONCENTRATIONS - Spacing factor for test concentrations: 2 - Justification for using less concentrations than requested by guideline: N/A - Range finding study - Test concentrations: 1, 10, 100 and 1000 mg/L - Results used to determine the conditions for the definitive study: After 96 hours, algal growth was inhibited by 15% and 100% at nominal concentrations of 100 and 1000 mg/l respectively; and growth stimulation was observed at 1 and 10 mg/L.
Reference substance (positive control):	yes
Remarks:	Potassium dichromate

Results and discussion

Effect concentrations

Effect concentrations 1

Duration:	96 h
Dose descriptor:	other: EbC50

Effect conc.:	52.4 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	biomass
Remarks on result:	other: 95 % CL of 50.1 - 55.8

Effect concentrations 2

Duration:	96 h
Dose descriptor:	NOEC
Effect conc.:	12.4 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	biomass

Effect concentrations 3

Duration:	96 h
Dose descriptor:	other: ErC50
Effect conc.:	72.3 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	growth rate
Remarks on result:	other: 95 % CL of 67.4 - 78.1

Effect concentrations 4

Duration:	96 h
Dose descriptor:	NOEC
Effect conc.:	12.4 mg/L
Nominal / measured:	meas. (geom. mean)
Conc. based on:	test mat.
Basis for effect:	growth rate

Details on results:

The mean coefficient of variation (CoV) for daily growth rates in control cultures ranged between 15.2 and 31.0% (mean value 23.2%) during the definitive test and the CoV for the average specific growth rates of control culture was 1.01% during the 96 hour exposure period. The variation observed in the control cultures is greater than normally observed as at each sampling occasion, samples for cell density determination originate from a separate culture.
No microscopic abnormalities of the cells were detected.

	Algistatic/algicidal extension: Subcultures (established in freshly-prepared culture medium) from test cultures containing n-BP at nominal 125 and 250 mg/L (measured, 105 and 205 mg/L) had re-established growth after nine days of incubation, indicating that at these levels, n-BP was algistatic. Subcultures containing n-BP at nominal 500 mg/L (measured, 447 mg/L) had re-established growth but not to the same density observed at other concentrations, indicating an algistatic effect with a prolonged recovery time.
Results with reference substance (positive control):	The results of the most recent laboratory reference test using potassium dichromate indicated that its 72-hour EbC50 to Pseudokirchneriella subcapitata was 0.64 mg/l; this was within the range typically obtained in this laboratory (0.3 to 1 mg/L).
Reported statistics and error estimates:	All 95% confidence intervals for EC50 were calculated using the likelihood ratio method (Donaldson and Schnabel, 1985). For Area Under Curve (AUC), each flask at each time was a separate observation in the analysis. These were analysed by mixed linear model with treatment by time as a fixed factor, separate variance for each time, all observations uncorrelated. The area under curve for each treatment was estimated as AUC (0-72h) = 24 mean(24) + 24mean(48) + 12mean(72) –60 x time 0 value. For growth rate, Williams' test (1971, 1972) and Dunnetts test (1955, 1964) were also used to compare each treated group with the control.

Any other information on results incl. tables

Table 1: Mean Cell Densities

Exposure concentrations (mg 1-bromopropane/L)		Cell densities (cells/mL)			
Nominal	Mean Measured	24 hours	48 hours	72 hours	96 hours
Control	N/A	22878	324778	696769	1051503
15.6	7.66	39706	321128	715372	949122
31.3	12.4	25822	309633	692328	951511
62.5	48.4	27967	249500	488383	510056
125	105	a	10472	12200	14406
250	205	a	1150	1222	2261
500	447	1317	9922	10200	10578

a = negative values i.e. no cells present in samples used for cell density determination

Table 2: Growth Inhibition at 96 hours

Mean Measured 1-bromopropane concentration (mg/L)	Area Under Curve	% Inhibition	P
Control	36.9	0.0	
7.66	36.4	1.5	0.604
12.4	35.3	4.6	0.117
48.4	24.0	35.0	< 0.001
105	- 0.129	100.3	< 0.001
205	- 0.733	102.0	< 0.001
477	- 0.188	100.5	< 0.001

Applicant's summary and conclusion

dity criteria fulfilled:	yes
Conclusions:	After 96 hours of exposure to n-BP, the EbC50 and ErC50, respectively were 52.4 and 72.3 mg/L. The “no observed effect concentration” (NOEC) for both area under the growth curve and growth rate was 12.4 mg/L. n-BP was found to have algistatic properties at measured concentrations of 105, 205 and 477 mg/L.
Executive summary:	The 96 hr-acute toxicity of 1-bromopropane to Freshwater green algae Pseudokirchnerella subcapitata was studied under static conditions. Algae were exposed to 1 -bromopropane dissolved in standard OECD medium at mean measured concentrations of 0, 7.66, 12.4, 48.4, 105, 205 and 447 mg/L for 96 hours. An extension of the study was performed to determine whether 1 -bromopropane had algistatic or algicidal properties. After 96 hours of exposure to 1 -bromopropane, the EbC50 and ErC50, respectively were 52.4 and 72.3 mg/L. The NOEC for both area under the growth curve and growth rate was 12.4 mg/L. 1 -bromopropane was found to have algistatic properties at measured concentrations of 105, 205 and 477 mg/L.

REACH

1-bromopropane

EC number: 203-445-0 | CAS number: 106-94-5

Ecotoxicological information

Toxicity to aquatic algae and cyanobacteria

004 Supporting | Experimental result

Administrative data

Endpoint:	toxicity to aquatic algae and cyanobacteria
Type of information:	experimental study
Adequacy of study:	supporting study
Study period:	17th February - 23rd March 1998
Reliability:	2 (reliable with restrictions)
Rationale for reliability incl. deficiencies:	other: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of the relevant results.

Data source

Reference

Reference Type:	study report
Title:	Unnamed
Year:	1998
Report Date:	1998

Materials and methods

Test guideline

Test guideline 1

Qualifier:	according to
Guideline:	OECD Guideline 201 (Alga, Growth Inhibition Test)
Deviations:	not specified

Test guideline 2

Qualifier:	according to
Guideline:	EU Method C.3 (Algal Inhibition test)
Deviations:	not specified

GLP compliance: yes (incl. certificate)

Test material

Reference

Name:	Unnamed
Type:	Constituent
Details on test material:	Purity is 99.47%

Sampling and analysis

Analytical monitoring: yes

Test solutions

Vehicle: no

Details on test solutions: A stock solution was prepared by dissolving 100 mg of 1-bromopropane in 1 litre of water, with the aid of mechanical agitation.

Test organisms

Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)

Details on test organisms:

TEST ORGANISM
- Common name: freshwater algae
- Strain: Pseudokirchnerella subcapitata
- Source (laboratory, culture collection): NDA
- Age of inoculum (at test initiation): NDA
- Method of cultivation: NDA

ACCLIMATION
- Acclimation period: NDA
- Culturing media and conditions (same as test or not): NDA
- Any deformed or abnormal cells observed: NDA

Study design

Test type: static

Water media type: freshwater

Limit test: no

al exposure duration:	72 h
Post exposure observation period:	N/A

Test conditions

Hardness:	NDA
Test temperature:	24.4 ± 1.1 ºC
pH:	During the test, the control pH varied by 0.85 units.
Dissolved oxygen:	NDA
Salinity:	NDA
Nominal and measured concentrations:	Measured initial concentrations of 54.98, 20.97, 8.53, 4.82, 1.65 and 0.93 mg/L
Details on test conditions:	The study was performed using 120 mL glass bottles stoppered with PTFE bungs and sealed with aluminium caps, containing 50 ml of test solution inoculated with an algal suspension so that the initial cell concentration was equal to 1x10^4 cells/mL. Tests flasks were incubated at 24.4 ± 1.1 °C continuously shaken and constantly exposed to a light intensity of between 6100 and 7200 lux. The algal concentration was measured daily. Analytical chemistry and physico-chemical measurements were carried out at the beginning and the end of the test.
Reference substance (positive control):	yes
Remarks:	Potassium dichromate

Results and discussion

Effect concentrations

Effect concentrations 1

Duration:	72 h
Dose descriptor:	other: EbC50
Effect conc.:	17 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.
Basis for effect:	biomass
Remarks on result:	other: 95 % CL (9.2 - 42)

Effect concentrations 2

Duration:	72 h
Dose descriptor:	other: EbC10
Effect conc.:	2.2 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.

Basis for effect:	biomass
Remarks on result:	other: 95 % CL (0.79 - 4)

Effect concentrations 3

Duration:	72 h
Dose descriptor:	other: NOECb
Effect conc.:	0.93 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.
Basis for effect:	biomass

Effect concentrations 4

Duration:	72 h
Dose descriptor:	other: ErC50
Effect conc.:	> 54.98 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.
Basis for effect:	growth rate

Effect concentrations 5

Duration:	72 h
Dose descriptor:	other: ErC10
Effect conc.:	8.1 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.
Basis for effect:	growth rate
Remarks on result:	other: 95% CL (4.4 - 16)

Effect concentrations 6

Duration:	72 h
Dose descriptor:	other: NOECr
Effect conc.:	0.93 mg/L
Nominal / measured:	meas. (initial)
Conc. based on:	test mat.

Basis for effect:	growth rate

Details on results:	The appearance of the test solutions was visually checked at the beginning and at the end of the test. Solutions were found to be clear and colourless. No precipitation was observed at the end of the test. Micoscopic observation confirmed that the algae appeared deformed and turgid in at the highest test concentration. The normal form of the unicellular algae observed in the control is a crescent shaped cell with an average length of 5-10 µm.
Results with reference substance (positive control):	Performed periodically to confirm validity of test system.
Reported statistics and error estimates:	The validity criteria of the study were respected : the increase in cell density (R), measured in the control solution between the end and the begining of the the test, was greater than a factor of 16 (R = 135) ; the final concentrations of 1-bromopropane were maintained within the designated limit of 80 % of the initial concentration in non inoculated flasks.

Applicant's summary and conclusion

Validity criteria fulfilled:	yes
Conclusions:	The 72 hour growth rate EC50 value for 1-bromopropane was determined to be > 54.98 mg/L. The 72 hour NOEC was determined to be 0.93 mg/L.
Executive summary:	In an acute toxicity to algae study, Freshwater algae (Selenastrum capricornutum) was exposed to 1 -bromopropane for 72 hours at measured initial concentrations of 54.98, 20.97, 8.53, 4.82, 1.65 and 0.93 mg/L The 72 hour growth rate EC50 value for 1-bromopropane was determined to be > 54.98 mg/L. The 72 hour NOEC was determined to be 0.93 mg/L.

REACH

1-bromopropane

EC number: 203-445-0 | CAS number: 106-94-5

Ecotoxicological information

Toxicity to microorganisms

001 Key | Experimental result

Administrative data

Endpoint:	activated sludge respiration inhibition testing
Type of information:	experimental study
Adequacy of study:	key study
Study period:	2010
Reliability:	1 (reliable without restriction)

Data source

Reference

Reference Type:	study report
Title:	Unnamed
Year:	2010
Report Date:	2010

Materials and methods

Test guideline

Test guideline 1

Guideline:	EU Method C.11 (Biodegradation: Activated Sludge Respiration Inhibition Test)

Test guideline 2

Guideline:	EPA OPPTS 850.6800 (Modified Activated Sludge, Respiration Inhibition Test for Sparingly Soluble Chemicals)

GLP compliance:	yes

Test material

Reference

Name:	Unnamed
Type:	Constituent

Sampling and analysis

Analytical monitoring:	yes

Test organisms

Test organisms (species):	activated sludge of a predominantly domestic sewage
Details on inoculum:	The activated sewage sludge sample was maintained on continuous aeration in the laboratory at a temp. of appr. 21 deg. C, and was used on the day of collection. The pH of the sample was 7.9 measured using a WTW pH/Oxi 340i pH and dissolved oxygen meter. Determinationof the suspended solids level of the activated sewage sludge was carried out by filtering a sample (100 ml) of the activated sewage sludge by suction. The suspended solids concentrationwas equal to 3.9 g/l prior to use.

Study design

Test type:	static
Water media type:	freshwater
Total exposure duration:	5 min

Test conditions

Hardness:	140 mg/l as CaCO3
Test temperature:	21 deg C +-1 deg C
pH:	7.6
Dissolved oxygen:	In some instances, the initial and the final dissolved oxygen concentrations were below those recommended in the test guideline. This was considered to have had no adverse effect on the results of the study given that in all cases the oxygen consumption rate was determined over the linear portion of the oxygen consumption trace.
Reference substance (positive control):	yes
Remarks:	3.5-dichlorphenol

Results and discussion

Effect concentrations

Effect concentrations 1

Duration:	5 min
Dose descriptor:	EC50
Effect conc.:	270 mg/L

Effect concentrations 2

Duration:	5 min
Dose descriptor:	NOEC
Effect conc.:	100 mg/L

Applicant's summary and conclusion

Executive summary:

A study was performed to assess the effect of the test item on the respiration of activated sewage sludge. The method followed that described in the OECD guidelines for testing of chemicals (1984) No 209 "activated sludge, respiration inhibition test", method C.11 of commission regulation (EC) No. 440/2008 and US EPA draft ecological effects test guidelines OPPTS 850.6800.

Following preliminary work and range-finding test, activated sewage sludge was exposed to an aqueous dispersion of the test item at concentrations of 100, 180, 320, 560 and 1000 mg/l for a period of 5 minutes in sealed vessels at a temperature of 21+- 1 degree celsius with the addition of a synthetic sewage as a respiratory substrate. Due to the volatile nature of the test item, the test duration was reduced from 3 hours, as specified in the test guidelines, to 5 minutes as it was considered likely that a longer test duration would result in significant losses of test item from the test system. In order to minimise any losses of test item from the test system, rathar than vigorous aeration of the test vessels, the test preparations were kept in suspension by stirring via magnetic stirrers and all vessels were sealed with film. The vapour pressure of the test item is 14.8 KPa at 20 degree celsius and the Henry's law constant for the test item was also calculated to be over 700 Pa.M3/mol which also confirms that the test item would be volatile under the normal conditions employed in an activated sludge, respiration inhibition test.

The rate of respiration was determined after 5 minutes contact time and compared to data for the control and a reference item 3,5-dichlorophenol

Results. The effect of the test item on the respiration of activated sewage sludge gave a 5 minute EC50 of 270 mg/l. The no observed effect concentration (NOEC) after 5 minutes exposure was 100 mg/l.

The reference item gave a 5 minute EC50 value 8.7 mg/l, 95% confidence limits 6.9-11 mg/l.