

Safety Data Sheet

REVISION: May 2016
Supersedes: May 2012 version



Boric Acid

Manufacturing Grade

Section 1 Identification of the substance/mixture and of the Company/undertaking

1.1 Product Identifier

| | |
|----------------------------|-------------------------------------------|
| Chemical name | Boric acid |
| CAS No: | 10043-35-3 |
| REACH Registration Number: | 01-2119486683-25-0000 |
| EC No: | 233-139-2 |
| Synonyms: | Boric acid, Orthoboric acid, Boracic acid |
| Product Names: | Boric acid MG |
| Grade: | Manufacturing Grade |

1.2 Relevant identified uses of the substance or mixture and uses advised against

| | |
|-----------------------|-------------------------------------------------------|
| Identified Uses: | Biocidal active ingredient |
| Uses advised against: | Consumer uses above the specific concentration limit. |

1.3 Details of the supplier of the SDS

| | |
|-------------------|------------------------------------------------------------------|
| Company Name: | Borax Europe Limited |
| Address: | 6 St. James's Square London, SW1Y 4AD United Kingdom |
| Telephone number: | +44 (0)20 7781 2000 |
| Email: | rtm.msds@riotinto.com |

| | |
|------------------------------------------|-----------------------------|
| 1.4 Emergency telephone number: | +44 (0) 1235 239 670 |
| Official advisory body telephone number: | None |

Section 2 Hazards identification

2.1 Classification of the substance or mixture

Classification (CLP Regulation (EC) No 1272/2008): Classified as toxic for reproduction (Repr. 1B; H360FD)

Boric acid has a specific concentration limit of $\geq 5.5\%$ for toxic for reproduction classification.

Classification (Directive 67/548/EEC): Classified as toxic for reproduction (Repr. Cat 2; R60-61)

Boric acid has a specific concentration limit of $\geq 5.5\%$ for toxic for reproduction classification.

Refer to Section 16 for the full text of Hazard Statements and R-phrases mentioned above.

2.2 Label Elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Hazard Pictograms



Signal word: Danger

Hazard statements:

H360FD: May damage fertility. May damage the unborn child.

Precautionary statements:

P202: Do not handle until all safety precautions have been read and understood.

P281: Use personal protective equipment as required.

P308+P313: IF exposed or concerned: Get medical advice.

P501: Dispose of contents/container in accordance with local regulation.

Supplemental Information

Restricted to professional users.

2.3 Other Hazards

H303: May be harmful if swallowed.

Section 3 Composition/information on ingredients

3.1 Substances

| Chemical Name | CAS# | EC# | % content | Classification (1272/2008/EC) | Classification (67/548/EEC) |
|---------------|------------|-----------|-----------|-------------------------------|-----------------------------|
| Boric acid | 10043-35-3 | 233-139-2 | >99.9 | Repr. 1B; H360FD | Repr. Cat 2; R60-61 |

Refer to Section 16 for the full text of Hazard Statements and R-phrases mentioned above.

Section 4 First aid measures

4.1 Description of First aid measures

Protection of first-aiders: No special protective clothing is required.

Inhalation: If symptoms such as nose or throat irritation are observed, remove to fresh air.

Eye contact: Use eye wash fountain or fresh water to cleanse eye. If irritation persists for more than 30 minutes, seek medical attention.

Skin contact: No treatment necessary.

Ingestion: Swallowing small quantities (one teaspoon) will cause no harm to healthy adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention.

4.2 Most important symptoms and effects both acute and delayed:

Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling (see Section 11).

- 4.3 Indication of any immediate medical attention and special treatment needed:** Note to physicians: Supportive care only is required for adult ingestion of less than a few grams of the product. For ingestion of larger amounts, maintain fluid and

electrolyte balance and maintain adequate kidney function. Gastric lavage is only recommended for heavily exposed, symptomatic patients in whom emesis has not emptied the stomach. Hemodialysis should be reserved for patients with massive acute absorption, especially for patients with compromised renal function. Boron analyses of urine or blood are only useful for verifying exposure and are not useful for evaluating severity of poisoning or as a guide in treatment¹.

Section 5 Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media: Use extinguishing media that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: None

5.2 Special hazards arising from substance or mixture

None. The product is not flammable, combustible or explosive.

5.3 Advice for fire fighters

Not applicable. The product is itself a flame retardant.

Section 6 Accidental release measures

6.1 Personal precaution, protective equipment and emergency procedures

For non-emergency personnel:

Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN166:1996, Respirators (CEN149) should be considered if environment is excessively dusty.

For emergency responders:

Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN166:1996, Respirators (CEN149) should be considered if environment is excessively dusty.

- 6.2 Environmental precautions:** The product is a water-soluble white powder that may cause damage to trees or vegetation by root absorption. Avoid contamination of water bodies during clean up and disposal. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level.

6.3 Methods and material for containment and cleaning up

Appropriate containment: Avoid spillage into water and cover drains.

Land spill: Vacuum, shovel or sweep up and place in containers for disposal in accordance with applicable local regulations.

Spillage into water: Where possible, remove any intact containers from the water.

6.4 Reference to other sections

Refer to sections 8, 12 and 13

Section 7 Handling and storage

7.1 Precautions for safe handling

Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills. Do not eat, drink and smoke in work areas. Wash hands after use. Remove contaminated clothing and protective equipment before entering eating areas.

7.2 Conditions for safe storage, including any incompatibilities

No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first-out basis.

Storage temperature: Ambient
Storage pressure: Atmospheric
Special sensitivity: Moisture (Caking)

7.3 Specific end use(s)

Refer to Annex – Exposure Scenarios.

Section 8 Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values: In the absence of a national OEL, Rio Tinto Borax recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m³. To convert product into equivalent boron (B) content, multiply by 0.175.

OELs of Member States of the EU

Substance: Boric acid, CAS#: 10043-35-3

| Country | 8-hr TWA (mg/m ³) | 15 min STEL (mg/m ³) | Legal basis |
|-------------|-------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------|
| Belgium | 2 | 6 | Moniteur Belge no 187, 30-06-2011 |
| Germany | 2.6 | 5.2 | TRGS 900 Arbeitsplatzgrenzwerte, 12-01-2012 |
| Italy | 2 | 6 | Decree no.106, 3-08-2009 |
| Latvia | 10 | - | Rules No. 92, 1-02-2011 |
| Lithuania | 10 | - | Hygiene Norm HN 23:2007; Order No. V-827/A1-287, 15 October 2007 |
| Spain | 2 | 6 | Valores Límites Ambientales (VLAs), Table 1, Límites de Exposición Profesional para Agentes Químicos 2011) |
| Switzerland | 10 | 10 | Limit Values at the Workplace 2011, as per SUVA |

DNELs

| Route of exposure | Workers | | | | Consumers | | | |
|-------------------|---------------------|------------------------|-----------------------|--------------------------|---------------------|------------------------|-----------------------|--------------------------|
| | Acute effects local | Acute effects systemic | Chronic effects local | Chronic effects systemic | Acute effects local | Acute effects systemic | Chronic effects local | Chronic effects systemic |
| Oral | Not Required | | | | * | 0.98 mg/kg/day | * | 0.98 mg/kg/day |
| Inhalation | * | * | * | 8.28 mg/m ³ | * | * | * | 4.15 mg/m ³ |
| Dermal | * | * | * | 392.0 mg/kg/day | * | * | * | 196.0 mg/kg/day |

* No hazard identified

Monitoring procedure: BS EN 14042:2003 Title identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

PNECs

| Compartment (Environment) | PNEC (added values) |
|---------------------------|------------------------------------------------|
| Water, fresh and marine | 2.02 mg B/L |
| Water, intermittent | 13.7 mg B/L |
| Air | No exposure expected |
| Soil | 5.4 mg B/kg dry soil |
| Sediment | Waived due to lack of partitioning to sediment |
| STP | 10 mg B/L |

8.2 Exposure controls

Appropriate engineering controls: Use local exhaust ventilation to keep airborne concentrations of dust below permissible exposure limits.

Personal protection equipment:

Eye and face protection: Eye protection according to CEN166:1996 may be warranted if environment is excessively dusty.

Skin protection: Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.

Respiratory protection: Where airborne concentrations are expected to exceed exposure limits, respirators should be used. (CEN149).

Environmental exposure controls:

Limiting releases from site: Where appropriate, material should be recovered and recycled through the process.

Spillages of powder or granulated borates should be swept or vacuumed up immediately and placed in containers for disposal in order to prevent unintentional release to the environment. Waste containing borates should be handled as a hazardous waste and removed by licensed operator to an offsite location where it can be incinerated or disposed to a hazardous landfill.

Water Emissions: Storage should be sheltered from precipitation. Avoid spillage into water and cover drains. Removal from water can only be accomplished by very specific treatment technologies including ion exchange resins, reverse osmosis etc. Removal efficiency is dependent upon a number of factors and will vary from 40 to 90%. Much of the technology is currently not appropriate to high volume or mixed waste streams. Boron is not removed in considerable amounts in conventional STP. If sites discharge to a municipal STP the concentration of boron should not exceed the PNEC in the municipal STP.

Air Emissions: Emissions to air can be removed by one or more of the following dust-control measures: electrostatic precipitators, cyclones, fabric or bag filters, membrane filters, ceramic and metal mesh filters, and wet scrubbers.

Section 9 Physical and chemical properties

9.1 Information on basic physical and chemical properties

| | |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Appearance: | White, crystalline solid |
| Odour | Odourless |
| Odour threshold: | Not applicable: odourless |
| pH @ 20°C: | 6.1 (0.1% solution); 5.1 (1.0% solution); 3.7 (4.7% solution) |
| Melting point/ Freezing point: | >1000 °C |
| Initial boiling point and boiling range: | Not applicable: melting point >300 °C |
| Flash point: | Not applicable: inorganic substance |
| Evaporation rate: | Not applicable: non-volatile |
| Flammability: | Non-flammable (used as a flame retardant) |
| Upper/lower flammability or explosive limits: | Not applicable: non-flammable |
| Vapour pressure: | Not applicable: melting point >300 °C |
| Vapour density: | Not applicable: melting point >300 °C |
| Relative density: | 1.49 @ 23°C |
| Solubility(ies): | Water: 49.2 g/L @ 20°C |
| Partition coefficient; n-octanol/water: | Log P _{ow} = -1.09 @ 22°C |
| Auto-ignition temperature: | Not applicable: not self-heating |
| Decomposition temperature: | If heated above 100 °C water is lost and boric acid converts initially to metaboric acid (HBO ₂) and on further heating forms boric oxide (B ₂ O ₃). |
| Viscosity: | Not applicable: solid substance |

| | |
|------------------------------|---------------------------------------------------------------------------------------|
| Explosive properties: | Not explosive: does not contain chemical groups associated with explosive properties. |
| Oxidising properties: | Not oxidising: does not contain chemical groups associated with oxidising properties |
| 9.2 Other information | |
| Molecular weight: | 61.8 |
| Formula: | H ₃ BO ₃ |

Section 10 Stability and reactivity

10.1 Reactivity: None known.

10.2 Chemical stability: Under normal ambient temperatures (-40 °C to +40°C), the product is stable product. When heated it loses water, first forming metaboric acid (HBO₂), and on further heating it is converted into boric oxide (B₂O₃).

10.3 Possibility of hazardous reactions: Boric acid is a weak acid that may cause corrosion of base metals. Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard.

10.4 Conditions to avoid: Avoid contact with strong reducing agents by storing according to good industrial practice.

10.5 Incompatible materials: Strong reducing agents.

10.6 Hazardous decomposition products: None.

Section 11 Toxicological Information

11.1 Information on toxicological effects

a) Acute toxicity

Method: Acute Oral Toxicity Study – OECD Guideline 401

Species: Rat

Dose: 2000 – 5000 mg/kg body weight Routes

of Exposure: Oral

Results: Low acute oral toxicity. The oral LD₅₀ value in male rats is 3,450 mg/kg bw, and in female rats is 4080 mg/kg bw.

Based on the available data, the classification criteria are not met.

Method: Acute Dermal Toxicity Study – U.S. EPA FIFRA Guidelines

Species: Rabbit

Dose: 2,000 mg/kg bw

Routes of Exposure: Dermal

Results: Low acute dermal toxicity; LD₅₀ in rabbits is > 2,000 mg/kg of body weight. Poorly absorbed through intact skin.

Based on the available data, the classification criteria are not met.

Method: Acute Inhalation Toxicity Study – OECD Guideline 403 Species:

Rat

Dose: 2.12 mg/L

Routes of Exposure: Inhalation

Results: Low acute inhalation toxicity; LC₅₀ in rats is > 2.0 mg/l (or g/m³). Based on the available data, the classification criteria are not met.

(b) Skin corrosion / irritation:

Method: Primary Dermal Irritation Study – EPA FIFRA (40 CFR 163)

Species: New Zealand White Rabbit

Dose: 0.5 g moistened with saline Routes

of Exposure: Dermal

Results: No skin irritation. Mean Primary Irritation Score: 0.1. Based on the available data, the classification criteria are not met.

(c) Serious eye damage / irritation:

Method: Eye Irritation Study – similar to OECD Guideline 405

Species: New Zealand White Rabbit

Dose: 0.1 g

Routes of Exposure: Eye

Results: Not irritating, corneal involvement or irritation clearing in 7 days.

Classification: Based on mean scores < 1, and the effects were fully reversible within 7 days, the classification criteria are not met. Many years of occupational exposure indicate no adverse effects on human eye.

(d) Respiratory or skin sensitisation: Method: Buehler Test – OECD Guideline 406

Species: Guinea Pig

Dose: 0.4 g 95 % w/w/boric acid Routes

of Exposure: Dermal

Results: Not a skin sensitiser. No respiratory sensitisation studies have been conducted. There are no data to suggest that boric acid is a respiratory sensitiser. Based on the available data, the classification criteria are not met.

(e) Germ cell mutagenicity:

Method: Several *in vitro* mutagenicity studies have been carried out on boric acid including gene mutation in mammalian cells, unscheduled DNA synthesis, chromosomal aberration and sister chromatid exchange in mammalian cells. Species: L5178Y mouse lymphoma, V79 Chinese hamster cells, C3H/10T1/2 cells, hepatocytes, Chinese hamster ovary (CHO cells).

Dose: 1.0 - 10.0 mg/ml (1000-10000ppm) boric acid

Routes of Exposure: *in vitro*

Results: Not mutagenic. Based on the available data, the classification criteria are not met.

(f) Carcinogenicity:

Method: OECD 451 equivalent.

Species: B6C3F1 mice

Dose: 446; 1150 mg boric acid/kg bw/day

Routes of Exposure: Oral feeding study

Results: No evidence of carcinogenicity. Based on the available data, the classification criteria are not met.

(g) Reproductive toxicity:

Method: Three-generation feeding study, similar to OECD 416 Two-Generation Study

Species: Rat

Dose: 0; 34 (5.9); 100 (17.5) and 336 (58.5) mg boric acid (mg B)/kg bw/day

Routes of Exposure: Oral feeding study

Results: NOAEL in rats for effects on fertility in males is 100 mg boric acid/kg bw equivalent to 17.5 mg B/kg bw.

Method: Prenatal Developmental Toxicity Study of Boric Acid – OECD Guideline 414 Species:

Rat

Dose: 0; 19 (3.3); 36 (6.3); 55 (9.6); 76 (13.3) and 143 (25) mg boric acid (mg B)/kg bw.

Routes of Exposure: Oral feeding study

Results: NOAEL in rats for developmental effects on the foetus including foetal weight loss and minor skeletal variations is 55 mg boric acid/kg bw or 9.6 mg B/kg.

Classification: Reproductive Toxicity Category 1B (Hazard statement: H360FD: May damage fertility or the unborn child.)

Method: Occupational studies of evaluating sensitive sperm parameters in highly exposed borate workers. Epidemiological studies evaluating high environmental exposures to boron and developmental effects in humans have been conducted.

Species: Human

Dose: A subset of workers was exposed to 125 mg B/day.

Routes of Exposure: Combined oral ingestion and inhalation

Results: No adverse fertility effects in male workers. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and populations living in areas with high environmental levels of boron.

Summary of evaluation of the CMR properties:

Boric acid is not mutagenic and has been tested in 2 year bioassays to be negative for carcinogenicity. Accordingly a classification for these endpoints for disodium tetraborates is not required under EC Directive 67/548/EEC or under CLP Regulation (EC) No. 1272/2008. A multigeneration study in the rat gave a NOAEL for fertility in males of 17.5 mg B/kg/day. Developmental effects have been observed in laboratory animals, the most sensitive species being the rat with a NOAEL of 9.6 mg B/kg bw/day. Disodium tetraborate is classified under the 1st ATP to CLP as Repr. 1B; H360FD. While boron has been shown to adversely affect male reproduction in laboratory animals, there was no clear evidence of male reproductive effects attributable to boron in studies of highly exposed workers.

(h) STOT-single exposure:

Method: Standard Test Method for Estimating Sensory Irritancy of Airborne Chemicals – ASTM E981-04 (2004) Species: Mouse

Dose: 221 - 1096 mg boric acid/m³ Routes of Exposure: Inhalation

Results: The highest concentration of boric acid that was achievable with acceptable control of the aerosol concentration was 1096 mg/m³ with a %RD of 19%. The lowest exposure tested of 221 mg/m³ boric acid resulted in a reduced respiration rate of 9%, graded as no irritation. Based on the available data, the classification criteria are not met.

Method: Sensory irritation in human volunteers
Species: Human

Dose: 2.5, 5, 10 mg boric acid/m³ Routes of Exposure: Inhalation

Results: No irritation from boric acid was observed at exposures up to 10 mg/m³ among male and female human volunteers under controlled laboratory conditions.

(i) STOT-repeated exposure:

Method: Chronic toxicity study of boric acid, similar to OECD 452 Species: Rat

Dose: 0; 33 (5.9); 100 (17.5); 334 (58.5) mg boric acid (B)/kg bw per day (nominal in diet)
Routes of Exposure: oral: feed

Results: A NOAEL of 17.5 mg B/kg bw/day equivalent to 100 mg boric acid/kg bw/day was determined in a chronic feeding study (2 years) in rats and is based on testes effects. Other effects (kidney, haemopoietic system) are regarded only at even higher dose levels. Based on the available data, the classification criteria are not met.

(j) Aspiration hazard: Physical form of solid powder indicates no aspiration hazard potential.

Toxicokinetics

In the blood boric acid is the main species present and is not further metabolised. Boric acid is distributed rapidly and evenly through the body, with concentrations in bone 2 - 3 higher than in other tissues. Boric acid is excreted rapidly, with elimination half-lives of 1 h in the mouse, 3 h in the rat and < 27.8 h in humans, and has low potential for accumulation. Boric acid is mainly excreted in the urine. Absorption of borates via the oral route is nearly 100 %. For the inhalation route also 100 % absorption is assumed as worst case scenario. Dermal absorption through intact skin is very low with a percent dose absorbed < 0.5%.

Information on likely routes of exposure:

Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because product is poorly absorbed through intact skin. Product is *not* intended for ingestion

Symptoms related to the physical, and chemical and toxicological characteristics:

Products are not intended for ingestion. Small amounts (e.g. a teaspoonful) swallowed accidentally are not likely to cause effects. Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling.

Delayed and immediate effects as well as chronic effects from short and long-term exposure:

Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid and sodium borate dust. Human epidemiological studies indicate no effect on fertility in occupational populations with chronic exposures to borate dust and indicate no effect to a general population with high exposures to borates in the environment.

Section 12 Ecological information

12.1 Toxicity

Note that the data values are expressed as boron equivalents. To convert to this product divide the boron equivalent by 0.175. Studies judged to be unreliable or with insufficient information to evaluate are not included.

Freshwater

Chronic studies

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric NOEC/EC10) | References |
|-----------------|-----------------------|------------------------------------------------|------------|
| | | | |

| | | | |
|----------------------------|---|---------------------------------------------------------------------------------------|------|
| Algal | 4 | 10 mg B/L (<i>Chlorella pyrenoidosa</i>) to 50 mg B/L (<i>Anacystis nidulans</i>) | 3, 4 |
| Higher plants | 3 | 4.0 mg B/L (<i>Phragmites australis</i>) to 60 mg B/L (<i>Lemna minor</i>) | 5, 6 |
| Invertebrate and protozoan | 7 | 5.7 mg B/L (<i>Daphnia magna</i>) to 32 mg B/L (<i>Chironomus riparius</i>) | 7, 8 |
| Fish | 6 | 2.9 mg B/L (<i>Micropterus salmoides</i>) to 17 mg B/L (<i>Carassius auratus</i>) | 9 |
| Amphibian | 2 | 29 mg B/L (<i>Rana pipiens</i>) to 41 mg B/L (<i>Bufo fowleri</i>) | 9 |

Results²: Based on the complete data set of 22 species, the HC₅ value of the species sensitivity distribution is 4.05 mg B/L.

Acute studies

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric EC/LC50) | References |
|----------------------------|-----------------------|----------------------------------------------------------------------------------------------|------------|
| Algal | 2 | 10 mg B/L (<i>Chlorella pyrenoidosa</i>) to 28 mg B/L (<i>Selenastrum capricornutum</i>) | 3, 10 |
| Invertebrate and protozoan | 9 | 113 mg B/L (<i>Ceriodaphnia dubia</i>) to 1376 mg B/L (<i>Chironomus decorus</i>) | 11, 12 |
| Fish | 7 | 80 mg B/L (<i>Pimephales promelas</i>) to 627 mg B/L (<i>Onchorhynchus tshawytscha</i>) | 11, 13 |
| Amphibian | 2 | 86 mg B/L (<i>Rana pipiens</i>) to 104 mg B/L (<i>Bufo fowleri</i>) | 9 |

Results²: Based on the complete data set from 46 studies with 20 species, the HC₅ value of the species sensitivity distribution is 27.3 mg B/L

Classification: Based on the acute data for freshwater species, this substance is not classified as hazardous to the environment.

Marine and Estuarine Data

Chronic studies

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric NOEC/EC10) | References |
|-----------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Algal | 19 | 5 mg B/L (<i>Emiliana huxleyi</i>) to >100 mg B/L (<i>Agmenellum quadruplicatum</i> , <i>Anacystis marina</i> , <i>Thalassiosira pseudonana</i>) | 4 |

Results: No data are available for invertebrate or vertebrate species. The results from the freshwater data set are recommended as applicable to marine and estuarine species.

Acute studies

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric EC/LC50) | References |
|-----------------|-----------------------|----------------------------------------------------------------------------------------|------------|
| Invertebrate | 3 | 45 mg B/L (<i>Litopenaeus vannamei</i>) to 83 mg B/L (<i>Americamysis bahia</i>) | 14, 15 |
| Fish | 2 | 74 mg B/L (<i>Limanda limanda</i>) to 600 mg B/L (<i>Oncorhynchus tshawytscha</i>) | 13, 16 |

No data are available for algal species.

Sediment

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric EC/LC50) | References |
|-----------------|-----------------------|----------------------------------------------|------------|
|-----------------|-----------------------|----------------------------------------------|------------|

| | | | |
|--------------|---|---------------------------------------------------------|--------|
| Invertebrate | 1 | 82.4 mg B/kg sediment dw (<i>Chironomus riparius</i>) | 17, 18 |
|--------------|---|---------------------------------------------------------|--------|

Results: Although limited, the data suggest that sediment organisms are within range of toxicity of aquatic organisms. In addition, the substance will not partition to the sediment, so a sediment/water partitioning approach is justified.

Sewage Treatment Plants (STP)

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric NOEC/EC10) | References |
|------------------|-----------------------|------------------------------------------------------------------------------------------|------------|
| Activated sludge | NA | >17.5 mg B/L to 100 mg B/L | 19 |
| Microbes | 3 | 10 mg B/L (<i>Opercularia bimarginata</i>) to 20 mg B/L (<i>Paramecium caudatum</i>) | 20 |

Terrestrial Data

Chronic studies

| Taxonomic Group | Number of Taxa Tested | Range of Endpoint Values (geometric NOEC/EC10) | References |
|-----------------|-----------------------|----------------------------------------------------------------------------------------------------------------------|------------|
| Plant | 28 | 7.2 mg B/kg dw (<i>Zea mays</i>) to 56 mg B/kg dw (<i>Allium cepa</i>) | 21, 22 |
| Invertebrates | 9 | 15.4 mg B/kg dw (<i>Folsomia candida</i>) to 87 mg B/kg dw (<i>Caenorhabditis elegans</i>) | 23, 24 |
| Soil micro | 3 | 12 mg B/kg dw (nitrogen mineralization and nitrification test) to 420 mg B/kg dw (soil nitrogen transformation test) | 25, 26 |

Results²: Based on the complete data set, the HC₅ value of the species sensitivity distribution is 10.8 mg B/kg dw.

Phytotoxicity: Boron is an essential micronutrient for healthy growth of plants. It can be harmful to boron sensitive plants in higher quantities. Care should be taken to minimise the amount of borate product released to the environment.

12.2 Persistence and Degradability

Biodegradation is not an applicable endpoint since the product is an inorganic substance.

12.3 Bioaccumulative potential

This product will undergo hydrolysis in water to form undissociated boric acid. Boric acid will not biomagnify through the foodchain. Octanol/Water partition coefficient: Log P_{ow} = -0.7570 @ 25 °C (based on boric acid)²⁷.

12.4 Mobility in soil

The product is soluble in water and is leachable through normal soil. Adsorption to soils or sediments is insignificant.

12.5 Results of PBT and vPvB assessment

According to Annex XIII of REACH, criteria for the assessment of PBT and vPvB properties do not apply to inorganic substances.

12.6 Other adverse effects

None

Section 13 Disposal considerations

13.1 Waste treatment methods

This product is classified as toxic to reproduction (Repr. 1B) and falls within scope of Directive 2008/98/EC as hazardous waste (H10). Dispose via a licensed waste disposal contractor.

Product packaging should be recycled where possible.

Local authorities should be consulted about any specific local requirements.

Such product should, if possible, be used for an appropriate application.

Section 14 Transport information

Transport Classification for Road(ADR) / Rail(RID); Inland waterways (ADN); SEA (IMDG); AIR (ICAO/IATA)

| | |
|--------------------------------------------------------------------------------|---------------|
| 14.1 UN Number: | Not Regulated |
| 14.2 UN Proper Shipping Name: | Not Regulated |
| 14.3 Transport hazard class(es): | Not Regulated |
| 14.4 Packing Group: | Not Regulated |
| 14.5 Environmental Hazards | Not Regulated |
| 14.6 Special precautions for user: | Not Regulated |
| 14.7 Transport in bulk according to Annex II of Marpol 73/78 and the IBC code: | Not Regulated |

Section 15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Regulation (EC) No 2037/2000 - Substances that deplete the ozone layer: Not manufactured with and does not contain any Group I or Group II ozone depleting substances.

Clean Air Act (Montreal Protocol):- Substances that deplete the ozone layer: Not manufactured with and does not contain any Class I or Class II ozone depleting substances.

Regulation (EC) No 689/2008 - Export and Import of Dangerous Chemicals: Not listed.

Regulation (EU) No 109/2012 – REACH Annex XVII: Restricted to professional users. The product is permitted for use in consumer products where it is below the specific concentration limit.

Commission Directive (2009/94/EC) – Inclusion directive as active substance in Annex I of 98/8/EC in Wood Preservatives (PT08).

National Regulations: Ensure all national/local regulations are observed.

Chemical inventory listing:

| | |
|--------------------------|------------|
| U.S. EPA TSCA Inventory: | 10043-35-3 |
| Canadian DSL: | 10043-35-3 |
| EINECS: | 233-139-2 |
| South Korea KECI: | KE-03499 |
| Japanese METI & ISHL: | (1)-63 |
| ChinaIECSC: | 10043-35-3 |

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out.

Section 16 Other information

Revision Details:

Section 1: Supplier address; Emergency telephone number.

Abbreviations and acronyms:

ATP: Adaption to Technical Progress

CLP: Classification, Labelling and Packaging Regulation (EC) No. 1272/2008

CMR: Carcinogen, Mutagen, Reproductive Toxin

EC: Effect concentration HC:

Hazard Concentration

LC: Lethal Concentration
 LD: Lethal Dose
 STOT: Specific Target Organ Toxicity
 DNEL: Derived No Effect Level
 LOEC: Lowest Observed Effect Concentration NA:
 Not applicable.
 NOAEL: No observed adverse effect level
 NOEC: No Observed Effect Concentration
 PNEC: Predicted No Effect Concentration
 PBT: Persistent, Bioaccumulative and Toxic
 vPvB: very Persistent, very Bioaccumulative
 TWA: Time Weighted Average
 STEL: Short-term exposure limit
 STP: Sewage Treatment Plant

References:

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26. Förster and Becker (2009) Unpublished report to REACH Consortium for Borates.
27. Cordia et al. (2003) Unpublished report no: PML 2002-C42r to Borax Europe, Ltd.

For general information on the toxicology of borates see ECETOC Technical Report No. 63 (1995); Patty's Toxicology, 6th Edition Vol. I, (2012) Chap. 23, 'Boron'. Culver, BD & Hubbard SA (1995) Inorganic Boron Health Effects in Humans: An Aid to Risk Assessment and Clinical Judgment. Trace Elements in Experimental Medicine 9(4):175-184.

Full text of Hazard statements mentioned in sections 2 and 3: H360FD:

May damage fertility. May damage the unborn child.

Full text of Risk Phrases mentioned in sections 2 and 3:

R60 May impair fertility.

R61 May cause harm to the unborn child.

Precautionary statements:

P202: Do not handle until all safety precautions have been read and understood.

P281: Use personal protective equipment as required.
 P308+P313: IF exposed or concerned: Get medical advice.
 P501: Dispose of contents/container in accordance with local regulation.

Precautionary Phrases: Restricted
 to professional users.
 Do not ingest.
 Keep out of reach of children.
 Refer to safety data sheet.
 Not for use in food or drugs.

The table in Annex – Exposure Scenarios lists the uses identified and registered for this substance with the indication of the Exposure Scenario(s) that is relevant to each identified use.

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Annex

Exposure Scenarios

The following table lists the uses identified and registered for this substance. Each use has a number of applicable human health, environmental and consumer exposure scenarios. These can be found at www.borax.com/EU-REACH/exposure-scenarios

| IU number | Sector | Identified Use | Life cycle stage | | | | | Sector of use category (SU) | Chemical Product Category (PC) | Process category (PROC) | Article category (AC) | Environmental release category (ERC) | Exposure Scenario | |
|-----------|------------------------|----------------------------------------------------------------------------|------------------|-------------|---------|--------------|-----------------------------|-----------------------------|--------------------------------|-------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Manufacture | Formulation | End use | Consumer use | Service life (for articles) | | | | | | Environment | Human Health |
| | | | | | | | | | | | | | | |
| 26 | Construction materials | Formulation/use of borates in construction materials (plaster board, wood) | | X | | | | 3, 13 | K35000, 8 | 4, 5, 8b, 14, 24, 26 | 4, 11 | 2, 3, 5 | <p>E4 - Generic formulation of borates into mixtures</p> <p>E8 - Generic formulation of borates into materials</p> <p>E11 - Generic industrial use of borates resulting in inclusion into or onto a matrix</p> | <p>ES7 - Discharging bags (25 -50 kg) into mixing vessels</p> <p>ES8 - Discharging big bags (750 – 1500kg) into mixing vessels</p> <p>ES16 - Closed production at ambient temperatures</p> <p>ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities</p> <p>ES21 - General maintenance activities</p> <p>ES22 - Transfer of substances into small containers</p> <p>ES31 - Compaction and tableting of boratecontaining powders</p> <p>ES32 - Working in a laboratory</p> |
| 27 | Construction materials | Professional use of construction materials | | | X | X | 22, 19 | K35000, 8 | 21 | 4 | 10a, 11a, 12a | <p>E21 – Generic industrial processing of articles with low abrasive techniques</p> <p>E27 - Generic wide dispersive use of articles containing borates with low release</p> | <p>ES37 - Professional installation of plasterboard, board and other products</p> | |

Note: The IU number as well as the Exposure Scenarios numbering is correct. Even if the numbering might be inconsistent in some cases, this is not a mistake. There are no documents missing.

