

Tributyl phosphate

sc-251295

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

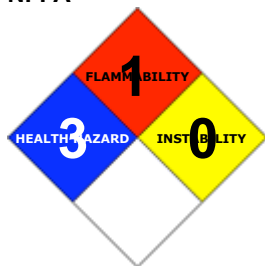
PRODUCT NAME

Tributyl phosphate

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C₁₂H₂₇PO₄, (C₄H₉)₃PO₄, TBP, "tri-n-butyl phosphate", "tri butyl phosphate", "trialkyl phosphate", "phosphoric acid tributyl ester"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	2		
Body Contact:	2		
Reactivity:	1		
Chronic:	2		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful if swallowed.
Irritating to skin.
Limited evidence of a carcinogenic effect.
May cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
 - Adverse effects of choline esters include nausea, vomiting, abdominal pain, flushing, sweating, salivation, watery eyes, runny nose, belching, loss of bowel and kidney control, reduced heart rate, heart block, constriction of airways low blood pressure and tightening of the chest.
 - Ingestion may produce nausea, vomiting, depressed appetite, abdominal cramps, and diarrhea.
 - Adverse effects associated with the administration of central nervous system stimulants include labored breathing, coughing, narrowed airways, chest tightness, and throat spasm.
- Muscular involvement may produce contraction small localized muscle fibers (visible through the skin) or seizures.

EYE

- Direct eye contact can produce tears, eyelid twitches, pupil contraction, loss of focus, and blurred or dimmed vision.
- Dilation of the pupils occasionally occurs.
- There is evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation.
- Severe inflammation may be expected with pain.

SKIN

- This material can cause inflammation of the skin on contact in some persons.
 - The material may accentuate any pre-existing dermatitis condition.
 - Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
 - There may be sweating and muscle twitches at site of contact.
- Reaction may be delayed by hours.
- Open cuts, abraded or irritated skin should not be exposed to this material.
 - Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
- Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

- The material is not thought to produce respiratory irritation (as classified using animal models).
- Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
- Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.
 - Inhalation hazard is increased at higher temperatures.
 - Organic phosphates are very stable and highly hazardous.
- There are a number of effects they can have on the body, including excitement of the central nervous system, and irritation of the skin and respiratory tract.

CHRONIC HEALTH EFFECTS

- There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.
- Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
- Repeated or prolonged exposures to cholinesterase inhibitors produce symptoms similar to acute effects. In addition workers exposed repeatedly to these substances may exhibit impaired memory and loss of concentration, severe depression and acute psychosis, irritability, confusion, apathy, emotional lability, speech difficulties, headache, spatial disorientation, delayed reaction times, sleepwalking, drowsiness or insomnia.
- Repeated oral administration to rats produced pathological changes in the bladder epithelium.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
tributyl phosphate	126-73-8	>99

Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed: · Contact a Poisons Information Center or a doctor at once. · If swallowed, activated charcoal may be advised.

EYE

- If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

- If product comes in contact with skin: · Contact a Poisons Information Center or a doctor. · DO NOT allow clothing wet with product to remain in contact with skin, strip all contaminated clothing including boots.

INHALED

- If spray mist, vapor are inhaled, remove from contaminated area. · Contact a Poisons Information Center or a doctor at once.

NOTES TO PHYSICIAN

- Most organophosphate compounds are rapidly well absorbed from the skin, conjunctiva, gastro-intestinal tract and lungs.
- They are detoxified by Cytochrome P450-mediated monooxygenases in the liver but some metabolites are more toxic than parent compounds.

Rats given a single oral dose of labeled tributyl phosphate excreted 50, 10 and 6% of the dose in urine, exhaled air and faeces, respectively, within 24 hours. The substance appeared in all tissues within 30 minutes. Step-wise debutylation, through hydroxylated intermediates, gives rise to dibutyl hydrogen phosphate and butyl dihydrogen phosphate.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	13.726
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	0.98
Lower Explosive Limit (%):	Not available.

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Combustible.
- Slight fire hazard when exposed to heat or flame.

Combustion products include: carbon dioxide (CO₂), phosphorus oxides (PO_x), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Type A Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.

MAJOR SPILLS

- Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

- Metal can or drum
- Packing as recommended by manufacturer.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.
- Store at room temperature.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - British Columbia Occupational Exposure Limits	tributyl phosphate (Tributyl phosphate)	0.2							
US - Minnesota Permissible Exposure Limits (PELs)	tributyl phosphate (Tributyl phosphate)	0.2	2.5						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)	0.2	2.5						
US - California Permissible Exposure Limits for Chemical Contaminants	tributyl phosphate (Tributyl phosphate)	0.2	2.5						
US - Idaho - Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)		5						
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	tributyl phosphate (Tributyl phosphate)	0.2		0.4					
US - Hawaii Air Contaminant Limits	tributyl phosphate (Tributyl phosphate)	0.2	2.5	0.4	5				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	tributyl phosphate (Tributyl phosphate)	-	5	-	5				
US - Washington Permissible exposure limits of air contaminants	tributyl phosphate (Tributyl phosphate)	0.2		0.6					
US - Alaska Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)	0.2	2.5						
Canada - Northwest Territories Occupational	tributyl phosphate (Tributyl phosphate)	0.2	2.2	0.4	4.4				

Exposure Limits (English)

US OSHA Permissible Exposure Levels (PELs) - Table Z1	tributyl phosphate (Tributyl phosphate)		5	
US - Michigan Exposure Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)	0.2	2.5	
US - Oregon Permissible Exposure Limits (Z-1)	tributyl phosphate (Tributyl phosphate)	-	5	
US NIOSH Recommended Exposure Limits (RELs)	tributyl phosphate (Tributyl phosphate)	0.2	2.5	
US ACGIH Threshold Limit Values (TLV)	tributyl phosphate (Tributyl phosphate)	0.2		TLV Basis: nausea; headache; eye & upper respiratory tract irritation
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	tributyl phosphate (Tributyl phosphate)	0.2	2.5	
Canada - Alberta Occupational Exposure Limits	tributyl phosphate (Tributyl phosphate)	0.2	2.2	
Canada - Prince Edward Island Occupational Exposure Limits	tributyl phosphate (Tributyl phosphate)	0.2		TLV Basis: nausea; headache; eye & upper respiratory tract irritation
Canada - Nova Scotia Occupational Exposure Limits	tributyl phosphate (Tributyl phosphate)	0.2		TLV Basis: nausea; headache; eye & upper respiratory tract irritation
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	tributyl phosphate (Tributyl phosphate)	0.2	2.2	
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	tributyl phosphate (Tributyl phosphate)		5	

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

- type a filter of sufficient capacity.

Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.

- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.

- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

ENGINEERING CONTROLS

- Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Floats on water.

State	Liquid	Molecular Weight	266.32
Melting Range (°F)	-112	Viscosity	Not Available
Boiling Range (°F)	552	Solubility in water (g/L)	Immiscible
Flash Point (°F)	295	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	>900	Vapor Pressure (mmHg)	13.726
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	0.98
Lower Explosive Limit (%)	Not available.	Relative Vapor Density (air=1)	9.2
Volatile Component (%vol)	Not available.	Evaporation Rate	Not available

APPEARANCE

Colourless to pale liquid. Odourless. Slightly soluble in water (1g/l). Soluble in alcohol, ether and benzene.

The physicochemical properties and environmental fate of the chemicals in this category are similar. They have a low melting point, a high boiling point or decomposition temperature, and low vapor pressure. The tri-esters are slightly soluble and the others are moderately soluble to soluble in water. The results of the hydrolysis studies with 2-ethylhexyl phosphate (CAS RN 12645-31-7), and triisobutyl phosphate (CAS RN: 126-71-6), and tributyl phosphate (CAS RN: 126-73-8) indicate that the mono-, di-, and tri-esters all are hydrolytically stable. Fugacity Level III calculations indicate that if they are released into the environment, they will exist predominantly in the soil and/ or soil or the aquatic environment depending on the environmental compartment that they first contact. The log Kow, indicates that they will not bioconcentrate. They exhibit appreciable biodegradation in 28 days or sooner indicating that they are moderately degradable if soluble and will not persist in the environment Tris(2-ethylhexyl) phosphate, which has limited solubility in water, exhibited 0% biodegradation after 28 days in the OECD 301D closed bottle test. log Kow 2.5-4.0

Material	Value
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Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

■ A number of phosphate and thiophosphate esters are of limited thermal stability and undergo highly exothermic self-accelerating decomposition reactions which may be catalyzed by impurities. The potential hazards can be reduced by appropriate thermal control measures.

Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

tributyl phosphate

TOXICITY AND IRRITATION

TRIBUTYL PHOSPHATE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Intraperitoneal (Rat) LD50: 251 mg/kg	Skin (rabbit): 10 mg/24h - SEVERE
Intravenous (Rat) LD: 100 mg/kg	Eye (rabbit): 97 mg
Oral (Mouse) LD50: 1189 mg/kg [CCINFO]*	
Inhalation (Mouse) LC50: 1300 mg/m ³ /4h	
Intraperitoneal (Mouse) LD50: 159 mg/kg	
Subcutaneous (Mouse) LD50: 764 mg/kg	

■ The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

for alkyl esters of phosphoric acid:

The chemicals in this category exhibit a low to moderate order of acute toxicity. The rat oral LD50 values ranged from 500-1000 mg/kg with 2-ethylhexyl phosphate to >36,800 mg/kg for tris(2-ethylhexyl) phosphate. The dermal LD50 values ranged from 1200 to > 2000 mg/kg (rat) with bis(2-ethylhexyl) hydrogen phosphate to > 20,000 mg/kg (rabbit) with tris(2-ethylhexyl) phosphate. The inhalation LC50 values ranged from > 0.447 mg/l (4 hr. rat) with tris(2-ethylhexyl) phosphate to > 5.14 mg/l (4 hr. rat) with triisobutyl phosphate.

Metabolism: Phosphoric acid esters are metabolized via dealkylation. Metabolism studies conducted on the tributyl phosphate indicate that dealkylation to form the alkyl alcohol is the primary route of metabolism. Phosphoric acid tri-esters are rapidly metabolised to di-esters with mono-di-esters also being produced. Studies of tributyl phosphate show that 40-64% of the parent compound is metabolised to dibutyl dihydrogen phosphate and that 1.1-2.1 % is metabolised to the monobutyl species. Therefore, tris(2-ethylhexyl) phosphate is expected to be metabolised to bis(2-ethylhexyl) phosphate (CAS RN: 298-07-7) and mono(2-ethylhexyl) phosphate (CAS RN 1070-03-7). Based on the evidence for dealkylation as the primary metabolic pathway, 2-ethylhexanol is the expected metabolite of tris(2-ethylhexyl) phosphate (CAS RN: 78-42-2) and 2-ethylhexyl phosphate (CAS RN: 12645-31-7). Triisobutyl phosphate is expected to be metabolised similarly as tributyl phosphate, with methoxypropanol as the alcohol metabolite.

Oral repeat dose NOAEL's in rats for dibutyl hydrogen phosphate, tributyl phosphate, ethylhexanol, 2-ethylhexanoic acid, bis(2-ethylhexyl) hydrogen phosphate, tris(2-ethylhexyl) phosphate, and triisobutyl phosphate were 30 mg/kg/day (44 days), 75 mg/kg/day (90 days), 125 mg/kg/day (90 days), 100 mg/kg/day (90 days), 250 mg/kg/day (5 days), and 1000 mg/kg/day (90 days), and 68.4-84.3 mg/kg (90 days), respectively.

The weight of the evidence indicates that the members of this category are not genotoxic. Tris(2-ethylhexyl) phosphate, bis(2-ethylhexyl) hydrogen phosphate, 2-ethylhexyl phosphate, dibutyl hydrogen phosphate, tributyl phosphate, triisobutyl phosphate, 2-ethylhexanol, 2-ethylhexanoic acid, and phosphoric acid were negative in the Ames assay. Tris(2-ethylhexyl) phosphate, bis(2-ethylhexyl) phosphate, 2-ethylhexyl phosphate, and 2-ethylhexanol also were negative in the mouse lymphoma assay. Furthermore, tris(2-ethylhexyl) phosphate, dibutyl hydrogen phosphate, tributyl phosphate, and 2-ethylhexanol were negative in the chromosomal aberration assays (in vitro and/ or in vivo). Tris(2-ethylhexyl) phosphate was negative in a sister chromatid exchange assay while 2-ethylhexanoic acid was positive. Triisobutyl phosphate was negative in the in vivo mouse micronucleus assay.

Reproductive toxicity was evaluated with a number of the members of this category. No effects on reproductive organs were observed in repeat dose studies with tris(2-ethylhexyl) phosphate, dibutyl hydrogen phosphate, tributyl phosphate, 2-ethylhexanol, or 2-ethylhexanoic acid. A two generation reproduction study with tributyl phosphate did not find any reproductive effects in rats at the highest dose tested (225 mg/kg/day). No significant effects on reproduction were seen in rats with an oral OECD 422 combined repeat dose toxicity and reproductive/developmental toxicity screen with dibutyl hydrogen phosphate (NOAEL = 1000 mg/kg). Reproductive effects were reported in rats at 300 mg/kg/day and 600 mg/kg/day in a one generation study with 2-ethylhexanoic acid.

Developmental toxicity: The developmental toxicity of tributyl phosphate was evaluated in both rats and rabbits. Tributyl phosphate and triisobutyl phosphate were determined not to be teratogenic. 2-Ethylhexanol was found to cause developmental toxicity only at doses that were maternally toxic. Drinking water and gavage developmental toxicity studies have also been conducted with 2-ethylhexanoic acid in rats and rabbits. Developmental effects in rats at concentrations as low as 100 mg/kg administered in drinking water have been reported. Developmental studies with rats and rabbits concluded that 2-ethylhexanoic acid did not produce developmental effects in rats or rabbits under the conditions of these tests. The authors noted that the rat NOAEL was 100 mg/kg/day based on slight foetotoxicity at 250 mg/kg/day and that the rabbit NOAEL was 250 mg/kg/day (highest dose). The maternal NOAEL's for rats and rabbits were 250 mg/kg/day and 25 mg/kg/day, respectively.

CARCINOGEN

tributyl phosphate	US - Rhode Island Hazardous Substance List	IARC
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Section 12 - ECOLOGICAL INFORMATION

May cause long-term adverse effects in the aquatic environment.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
tributyl phosphate	LOW	No Data Available	LOW	MED

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____
_____ Tributyl 131 697 4 2 2 R 3 0 1 0 2 2 2 S F 3 phosphate 9 / CAS:126- 73- 8 /

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships)
NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation,
B1=Acute aquatic toxicity LC/EC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg),
C2=Acute mammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion,
D2=Eye irritation & corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference
with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen,
M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lung injury, N=Neurotoxic,
I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking
substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List
of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

tributyl phosphate (CAS: 126-73-8) is found on the following regulatory lists;

"Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Permissible Exposure Limits (Z-1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List"

Section 16 - OTHER INFORMATION

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merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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