1-BUTOXYPROPAN-2-OL

(CAS #5131-66-8)

GREENSCREEN® FOR SAFER CHEMICALS (GREENSCREEN®) ASSESSMENT

Prepared by:

ToxServices LLC

Assessment Date: June 25, 2021

Expiration Date: June 25, 2026

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GreenScreen® Executive Summary for 1-Butoxypropan-2-ol (CAS #5131-66-8)

1-Butoxypropan-2-ol, also commonly referred to as propylene glycol n-butyl ether (or PnB), is a propylene glycol ether used primarily as a solvent in chemical manufacturing. It is also used as a coupling agent, a binding agent, and chemical intermediate. In household cleaners, 1-butoxypropan-2-ol typically varies in concentration from 0 – 6.5% of the total product formulation. 1-Butoxypropan-2-ol is a liquid that is volatile, highly soluble in water, and flammable.

1-Butoxypropan-2-ol was assigned a **GreenScreen Benchmark™ Score of 3** ("Use but Still Opportunity for Improvement"). This score is based on the following hazard score combinations:

- Benchmark 3c
  - Moderate Group II Human Health Hazard (neurotoxicity (single dose)-Ns)
  - High Group II Human Health Hazard (skin irritation-IrS and eye irritation-IrE)
- Benchmark 3d
  - Moderate Physical Hazard (flammability-F)

A data gap (DG) exists for endocrine activity-E. As outlined in GreenScreen® Guidance Section 11.6.2.1 and Annex 5 (Conduct a Data Gap Analysis), 1-butoxypropan-2-ol meets requirements for a GreenScreen Benchmark™ Score of 3 despite the hazard data gap. In a worst-case scenario, if 1-butoxypropan-2-ol were assigned a High score for the data gap E, it would be categorized as a Benchmark 1 Chemical.

New Approach Methodologies (NAMs) used in this GreenScreen® include *silico* modeling for endocrine activity, respiratory sensitization, chronic aquatic toxicity, and bioaccumulation, and *in vitro* assays for mutagenicity and endocrine activity. The quality, utility, and accuracy of NAM predictions are greatly influenced by two primary types of uncertainties:

- Type I: Uncertainties related to the input data used
- Type II: Uncertainties related to extrapolations made

Type I (input data) uncertainties in 1-butoxypropan-2-ol's NAMs dataset include no experimental or human data for endocrine activity, respiratory sensitization, and two trophic levels of chronic aquatic toxicity. In addition, the OECD UDS assay guideline has been deleted due to poor performance and lack of use. 1-Butoxypropan-2-ol's Type II (extrapolation output) uncertainties include limitation of *in vitro* genotoxicity assays in mimicking *in vivo* metabolism, their focusing on one or only a few types of genotoxicity events, the lack of applicability domains for ToxCast models for endocrine activity and OECD Toolbox for respiratory sensitization, the limitation of respiratory sensitization structure alerts in not accounting for non-immunologic mechanisms of respiratory sensitization, and uncertain *in vivo* relevance of *in vitro* high throughput screening assays for endocrine activity. Some of 1-butoxypropan-2-ol's type II uncertainties were alleviated by the use of *in vitro* test batteries and/or in combination of *in vivo* data.

GreenScreen® Hazard Summary Table for 1-Butoxypropan-2-ol

Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
C	M	R	D	E	AT	ST		N		SnS	SnR	IrS	IrE	AA	CA	P	B	Rx	F
						s	r*	s	r*	*	*								
L	L	L	L	DG	L	L	L	M	L	L	*L*	H	H	L	*L*	vL	vL	*L*	M

Note: Hazard levels (Very High (vH), High (H), Moderate (M), Low (L), Very Low (vL)) in *italics* reflect lower confidence in the hazard classification while hazard levels in **BOLD** font reflect higher confidence in the hazard classification. Group II Human Health endpoints differ from Group II* Human Health endpoints in that they have four hazard scores (i.e., vH, H, M, and L) instead of three (i.e., H, M, and L), and are based on single exposures instead of repeated exposures. Group II* Human Health endpoints are indicated by an * after the name of the hazard endpoint or after "repeat" for repeated exposure sub-endpoints. Please see Appendix A for a glossary of hazard acronyms.

GreenScreen® Chemical Assessment for 1-Butoxypropan-2-ol (CAS #5131-66-8)

Method Version: GreenScreen® Version 1.4
Assessment Type[1]: Certified
Assessor Type: Licensed GreenScreen® Profiler

GreenScreen® Assessment (v.1.2) Prepared By:
Name: Chris Schlosser, M.F.S.
Title: Associate Toxicologist
Organization: ToxServices LLC
Date: September 20, 2012

Quality Control (v.1.2) Performed By:
Name: Dr. Margaret H. Whittaker, Ph.D., M.P.H., CBiol., F.R.S.B., E.R.T., D.A.B.T.
Title: Managing Director and Chief Toxicologist
Organization: ToxServices LLC
Date: October 12, 2012

GreenScreen® Assessment (v.1.4) Updated By:
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Title: Associate Toxicologist
Organization: ToxServices LLC
Date: July 17, 2018

Quality Control (v.1.4) Performed By:
Name: Bingxuan Wang, Ph.D., D.A.B.T.
Title: Senior Toxicologist
Organization: ToxServices LLC
Date: July 17, 2018

GreenScreen® Assessment (v.1.4) Prepared By:
Name: Margaret H. Rubens, M.P.H.
Title: Associate Toxicologist
Organization: ToxServices LLC
Date: June 23, 2021

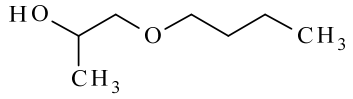
Quality Control (v.1.4) Performed By:
Name: Bingxuan Wang, Ph.D., D.A.B.T.
Title: Senior Toxicologist
Organization: ToxServices LLC
Date: June 25, 2021

Expiration Date: June 25, 2026[2]

Chemical Name: 1-Butoxypropan-2-ol

CAS Number: 5131-66-8

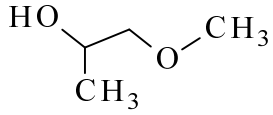
Chemical Structure(s):



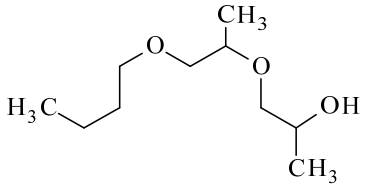
Also called: 1,2-Propylene glycol 1-monobutyl ether, 2-Propanol, 1-butoxy-, Butoxypropanol, n-Butoxy-2-propanol, 1-Butoxy-2-propanol, 2-Hydroxy-3-butoxypropane, 4-01-00-02471 (Beilstein Handbook Reference), AI3-18549, BRN 1733910, EC 225-878-4, EINECS 225-878-4, n-Butoxy-2-propanol, n-Butoxypropanol, NSC 2211, Propasol solvent B, Propylene glycol monobutyl ether, Propylene glycol n-butyl ether, UNII-K0MR13CZ2E (ChemIDplus 2021)

[1] GreenScreen® reports are either "UNACCREDITED" (by unaccredited person), "AUTHORIZED" (by Authorized GreenScreen® Practitioner), or "CERTIFIED" (by Licensed GreenScreen® Profiler or equivalent).
[2] Assessments expire five years from the date of completion starting from January 1, 2019. An assessment expires three years from the date of completion if completed before January 1, 2019 (CPA 2018a).

Suitable surrogates or moieties of chemicals used in this assessment (CAS #'s):
Insufficient data were available for 1-butoxypropan-2-ol to address all endpoints. Data for structurally similar chemicals dipropylene glycol butyl ether (DPnB) and propylene glycol methyl ether (PGME) were used as these chemicals contain similar functional groups, belong to the same chemical class (Propylene Glycol Ethers (PGEs)), and have similar physiochemical properties (UNEP 2003). PGME is the ether of one molecule of propylene glycol and methanol, while DPnB is the ether of two molecules of propylene glycol and 1-butanol. The target compound, 1-butoxypropan-2-nol, is the ether of one molecule of propylene glycol and 1-butanol. They are expected to be metabolized into propylene glycol and their respective alcohol (UNEP 2003), and likely have similar toxicological profiles.



Propylene Glycol Methyl Ether (PGME)
(CAS #107-98-2)



Dipropylene Glycol Butyl Ether (DPnB)
(CAS #29911-28-2)

Identify Applications/Functional Uses:
1. Coupling agent (HERA 2005)
2. Solvent (HERA 2005)
3. Coalescent/binding agent (UNEP 2003)
4. Chemical intermediate (UNEP 2003)

Known Impurities[3]:
1-Butoxypropan-2-ol is the major isomer formed during chemical synthesis (ca. 95%); however, DPnB, dipropylene glycol methyl ether acetate (DPMA), tripropylene glycol methyl ether (TPM), and propylene glycol 2-butyl ether (PGBE) are also formed as part of the mixture of isomeric components. Water may also be present at up to 0.15%. Although not typically available as 100% (but at least 99% pure) (UNEP 2003), 1-butoxypropan-2-ol, the screen is performed on the theoretical pure substance.

[3] Impurities of the chemical will be assessed at the product level instead of in this GreenScreen®.

GreenScreen® Summary Rating for 1-Butoxypropan-2-ol[4,5 6,7]: 1-Butoxypropan-2-ol was assigned a **GreenScreen Benchmark™ Score of 3** ("Use but Still Opportunity for Improvement") (CPA 2018b). This score is based on the following hazard score combinations:

- Benchmark 3c
  - Moderate Group II Human Health Hazard (neurotoxicity (single dose)-Ns)
  - High Group II Human Health Hazard (skin irritation-IrS and eye irritation-IrE)
- Benchmark 3d
  - Moderate Physical Hazard (flammability-F)

Data gaps (DG) exist for endocrine activity-E. As outlined in GreenScreen® Guidance (CPA 2018b) Section 11.6.2.1 and Annex 5 (Conduct a Data Gap Analysis), 1-butoxypropan-2-ol meets requirements for a GreenScreen Benchmark™ Score of 3 despite the hazard data gap. In a worst-case scenario, if 1-butoxypropan-2-ol were assigned a High score for the data gap E, it would be categorized as a Benchmark 1 Chemical.

Figure 1: GreenScreen® Hazard Summary Table for 1-Butoxypropan-2-ol

Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
C	M	R	D	E	AT	ST		N		SnS	SnR	IrS	IrE	AA	CA	P	B	Rx	F
						s	r*	s	r*	*	*								
L	L	L	L	DG	L	L	L	M	L	L	*L*	H	H	L	*L*	vL	vL	*L*	M

Note: Hazard levels (Very High (vH), High (H), Moderate (M), Low (L), Very Low (vL)) in *italics* reflect lower confidence in the hazard classification while hazard levels in **BOLD** font reflect higher confidence in the hazard classification. Group II Human Health endpoints differ from Group II* Human Health endpoints in that they have four hazard scores (i.e., vH, H, M, and L) instead of three (i.e., H, M, and L), and are based on single exposures instead of repeated exposures. Group II* Human Health endpoints are indicated by an * after the name of the hazard endpoint or after "repeat" for repeated exposure sub-endpoints. Please see Appendix A for a glossary of hazard acronyms.

Environmental Transformation Products

1-Butoxypropan-2-ol is stable in water and is not expected to hydrolyze readily (UNEP 2003). 1-Butoxypropan-2-ol is susceptible to photo-degradation with atmospheric photo-degradation half-life of 4.6 hours (UNEP 2003). QSAR modeling indicates that two hydrolysis products are expected from under acidic conditions: propylene glycol (CAS #57-55-6); and butyl alcohol (CAS #71-36-3) (OECD 2020a). No products are expected under neutral or basic conditions. Additionally, six degradation products were identified following autoxidation simulation including: lactaldehyde (CAS #3913-65-3), 1-(1-hydroperoxybutoxy)propan-2-ol (No CAS); 1-butoxy-1-hydroperoxy-propan-2-ol (No CAS); 1-(2-hydroxypropoxy)butan-1-ol (No CAS); 1-butoxypropane-1,2-diol (No CAS) and butanal (CAS #123-72-8) (OECD 2020a). As 1-butoxypropan-2-ol is readily biodegradable (see Persistence section below), none of the predicted feasible transformation products are persistent enough to be relevant for this assessment.

[4] For inorganic chemicals with low human and ecotoxicity across all hazard endpoints and low bioaccumulation potential, persistence alone will not be deemed problematic. Inorganic chemicals that are only persistent will be evaluated under the criteria for Benchmark 4.
[5] See Appendix A for a glossary of hazard endpoint acronyms.
[6] For inorganic chemicals only, see GreenScreen® Guidance v1.4 Section 12 (Inorganic Chemical Assessment Procedure).
[7] For Systemic Toxicity and Neurotoxicity, repeated exposure data are preferred. Lack of single exposure data is not a Data Gap when repeated exposure data are available. In that case, lack of single exposure data may be represented as NA instead of DG. See GreenScreen® Guidance v1.4 Annex 2.

Table 1: Environmental Transformation Product Summary						
Life Cycle Stage	**Transformation Pathway**	**Environmental Transformation Product**	**CAS #**	**Feasible (Yes or No)**	**Relevant (Yes or No)**	**GreenScreen® List Translator Score or GreenScreen® Benchmark Score[8,9]**
End	Acidic hydrolysis	Propylene glycol	57-55-6	Yes	No	BM 2
End	Acidic hydrolysis	Butyl alcohol	71-36-3	Yes	No	BM 2
End	Autoxidation	Lactaldehyde	3193-65-3	Yes	No	Not listed in Pharos
End	Autoxidation	1-(1-Hydroperoxybutoxy)propan-2-ol	N/A	Yes	No	Not listed in Pharos
End	Autoxidation	1-Butoxy-1-hydroperoxy-propan-2-ol	N/A	Yes	No	Not listed in Pharos
End	Autoxidation	1-(2-Hydroxypropoxy)butan-1-ol	N/A	Yes	No	Not listed in Pharos
End	Autoxidation	1-Butoxypropane-1,2-diol	N/A	Yes	No	Not listed in Pharos
End	Autoxidation	Butanal	123-72-8	Yes	No	LT-UNK

Introduction

1-Butoxypropan-2-ol is, also commonly referred to as propylene glycol n-butyl ether (or PnB), is a propylene glycol ether used primarily as a solvent in chemical manufacturing (UNEP 2003). Glycol ethers are clear liquids with high boiling points, low to moderate volatility, and high water solubility (HERA 2005). In 1999, about 285 million pounds of propylene glycol ethers were produced in the United States. Propylene glycol ethers are manufactured by reacting propylene oxide with methyl alcohol or n-butyl alcohol. They are often used as solvents, chemical intermediates and coupling agents in cleaners, coatings, paints, lubricants, and cosmetic products (UNEP 2003). In household cleaners, 1-butoxypropan-2-ol typically varies in concentration from 0 – 6.5% of the total product formulation (HERA 2005).

ToxServices assessed 1-butoxypropan-2-ol against GreenScreen® Version 1.4 (CPA 2018b) following procedures outlined in ToxServices' SOPs (GreenScreen® Hazard Assessment) (ToxServices 2020).

U.S. EPA Safer Choice Program's Safer Chemical Ingredients List

The SCIL is a list of chemicals that meet the Safer Choice standard (U.S. EPA 2020a). It can be accessed at: http://www2.epa.gov/saferchoice/safer-ingredients. Chemicals on the SCIL have been assessed for compliance with the Safer Choice Standard and Criteria for Safer Chemical Ingredients (U.S. EPA 2015).

1-Butoxypropan-2-ol (propylene glycol n-butyl ether) is listed on the U.S. EPA SCIL with a full green circle as a solvent.

GreenScreen® List Translator Screening Results

The GreenScreen® List Translator identifies specific authoritative or screening lists that should be searched to identify GreenScreen Benchmark™ 1 chemicals (CPA 2018b). Pharos (Pharos 2021) is an online list-searching tool that is used to screen chemicals against all of the lists in the List Translator electronically. ToxServices also checks the U.S. Department of Transportation (U.S. DOT) lists (U.S.

[8] The GreenScreen® List Translator identifies specific authoritative or screening lists that should be searched to screen for GreenScreen® benchmark 1 chemicals (CPA 2018b). Pharos (Pharos 2021) is an online list-searching tool that is used to screen chemicals against the lists in the List Translator electronically.
[9] A GreenScreen® assessment of a transformation product depends on the Benchmark score of the parent chemical (see GreenScreen® Guidance).

DOT 2008a,b),[10] which are not considered GreenScreen® Specified Lists but are additional information sources, in conjunction with the Pharos query. The output indicates benchmark or possible benchmark scores for each human health and environmental endpoint. The output for 1-butoxypropan-2-ol can be found in Appendix C.

- 1-Butoxypropan-2-ol is an LT-UNK chemical when screened using Pharos, and therefore a full GreenScreen® is required.
- 1-Butoxypropan-2-ol is listed on the U.S. DOT list as a Hazard Class 3 chemical (Flammable and Combustible Liquid), Packing Group III – Minor Danger.
- 1-Butoxypropan-2-ol is on the following lists for multiple endpoints.
  - German FEA – Substances Hazardous to Waters: Class 1 – Low Hazard to Waters
  - Quebec CSST – WHMIS 1988: Class D2B – Toxic material causing other toxic effects
- Specified lists for single endpoints are reported in individual hazard endpoints in the hazard assessment section below.

Hazard Statement and Occupational Control

Two Globally Harmonized System of Classification and Labelling of Chemicals (GHS) hazard statements that are harmonized in the European Union (EU) were identified for 1-butoxypropan-2-ol, as shown in Table 2 below. General personal protective equipment (PPE) recommendations are presented in Table 3, below. No occupational exposure limits (OELs) were identified.

Table 2: GHS H Statements for 1-Butoxypropan-2-ol (CAS #5131-66-8) (ECHA 2021, Pharos 2021)

H Statement	H Statement Details
H315	Causes skin irritation
H319	Causes serious eye irritation

Table 3: Occupational Exposure Limits and Recommended Personal Protective Equipment for 1-Butoxypropan-2-ol (CAS #5131-66-8)

Personal Protective Equipment (PPE)	Reference	Occupational Exposure Limits (OEL)	Reference
Wear protective gloves, eye protection, and face protection.	Sigma-Aldrich 2020	None identified.	n/a
Impervious clothing and respiratory protection (where chemical may be aerosolized)			

Physicochemical Properties of 1-Butoxypropan-2-ol

1-Butoxypropan-2-ol is a clear liquid at standard temperature and pressure. It is highly soluble in water and has a high vapor pressure indicating that it readily forms a vapor. Its log K_{ow} of 1.2 indicates that tis chemical is not likely to bioaccumulate.

Table 4: Physical and Chemical Properties of 1-Butoxypropan-2-ol (CAS #5131-66-8)

Property	Value	Reference
Molecular formula	C7-H16-O2	ChemIDplus 2021
SMILES Notation	CCCCOCC(C)O	ChemIDplus 2021

[10] DOT lists are not required lists for GreenScreen® List Translator v1.4. They are reference lists only.

Table 4: Physical and Chemical Properties of 1-Butoxypropan-2-ol (CAS #5131-66-8)		
Property	**Value**	**Reference**
Molecular weight	132.201 g/mol	ChemIDplus 2021
Physical state	Liquid	ECHA 2021
Appearance	Clear, colorless	ECHA 2021
Melting point	-85°C	ECHA 2021
Boiling point	171.5°C	ChemIDplus 2021
Vapor pressure	1.39 hPa (1 mm Hg) at 20°C	ECHA 2021
Water solubility	55 g/l at 20°C	ECHA 2021
Dissociation constant	Glycol ethers are very weak acids and there is very little hydrogen ion dissociated. In addition, there is almost no water present in the glycol ether. Thus, dissociation does not occur.	ECHA 2021
Density/specific gravity	0.88 g/cm^3 at 20°C	ECHA 2021
Partition coefficient	Log K_{ow} = 1.2 at 20°C (experimental)	ECHA 2021

Toxicokinetics

No relevant data were identified specifically for 1-butoxypropan-2-ol. As a class, PGEs are expected to be rapidly absorbed via inhalation (vapor and aerosol) and oral routes. Dermal absorption would be expected to be relatively slower (UNEP 2003). Absorbed PGEs are rapidly distributed throughout the body, based on studies conducted on other PGEs (UNEP 2003).

PGEs are metabolized predominantly in the liver. The mixed function oxidase breaks the ether bond and produces propylene glycol and an alcohol (UNEP 2003). Therefore, in the case of 1-butoxypropan-2-ol, the primary metabolites are expected to be propylene glycol and 1-butanol, which are expected to be further metabolized to carbon dioxide and water. Another route of metabolism of the parent compound or intermediate metabolites is conjugation with glucuronide, sulfate, and/or glutathione (UNEP 2003).

The ultimate metabolite carbon dioxide is expected to be excreted in expired air, while the phase II conjugation products are expected to be mainly excreted in the urine. Only a small fraction will excrete through feces (UNEP 2003).

Hazard Classification Summary

Group I Human Health Effects (Group I Human)

Carcinogenicity (C) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for carcinogenicity based on lack of effects reported for the surrogate PGME (CAS #107-98-2). GreenScreen® criteria classify chemicals as a Low hazard for carcinogenicity when adequate negative data are available and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on high quality measured data for a strong structural surrogate.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021

  - *Inhalation: Surrogate: PGME (CAS #107-98-2):* A GLP compliant chronic toxicity/carcinogenicity study (OECD 453) was conducted using male and female F344 rats (50/sex/group). Rats were exposed to concentrations of 0, 300, 1,000 and 3,000 ppm of PGME vapor (> 99.6% purity) via whole body inhalation for 6 hours/day, 5 days/week, for 2 years. Clinical chemistry, hematological examinations, urinalyses, determination of body and organ weights, and histopathological examinations were conducted. Additionally, specialized studies were conducted to evaluate cell proliferation in liver and kidneys, hepatic Mixed Function Oxidase (MFO) activity, and α2μ-g nephropathy. MFO activity was increased in the livers of rats exposed to 3,000 ppm PGME. Kidney histopathology revealed α2μ-g nephropathy in the mid and top dose groups of male rats. No increases in renal epithelial tumors were reported. No carcinogenic effects were identified; and no statistically significant increases in tumors were identified, even in the presence of α2μ-g nephropathy. Based on the reported data, PGME is not a carcinogenic compound to rats (Klimisch Score 2, reliable with restrictions).
  - *Inhalation: Surrogate: PGME (CAS #107-98-2):* A GLP compliant chronic toxicity/carcinogenicity study was conducted using male and female B6C3F1 mice (50/sex/group). Mice were exposed to concentrations of 0, 300, 1,000 and 3,000 ppm of PGME vapor (> 99.6% purity) (corresponding to 1.11, 3.69, and 11.07 mg/L) via whole body inhalation for 6 hours/day, 5 days/week, for 2 years. Clinical chemistry, hematological examinations, urinalyses, determination of body and organ weights, and histopathological examinations were conducted. Animals exposed to the highest dose tested displayed decreased activity, incoordination, and transient sedation during the first week of exposure, but these effects were not observed after the second week. Cumulative mortality increased, but was not statistically significant. PGME exposure caused a statistically significant decrease in body weights of exposed animals compared to controls. Mice of both sexes in the high dose groups had a statistically significant decrease in mean in-life body weights, but this effect was not observed at study termination. Males and females in the high dose group had an increased absolute liver weight of approximately 8% and 6% relative to controls, respectively. No other treatment-related effects on the kidney weight or other organs were observed in male or female exposed mice. No treatment-related lesions were observed in mice through study termination (Klimisch Score 2, reliable with restrictions).
- HERA 2005
  - No evidence of carcinogenicity has been observed for 1-butoxypropan-2-ol.
- UNEP 2003
  - *Surrogate: PGME (CAS #107-98-2):* PGME is the only member in the propylene glycol ethers category that has been tested for carcinogenicity. No evidence of carcinogenic effects was observed for PGME.

Mutagenicity/Genotoxicity (M) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for mutagenicity/genotoxicity based on no evidence of genotoxic effects in *in vitro* mutagenicity and clastogenicity assays in prokaryotic and eukaryotic cells. GreenScreen® criteria classify chemicals as a Low hazard for mutagenicity/genotoxicity when negative data are available for both gene mutations and chromosome aberrations, and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on high quality measured data on the target chemical.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.

- ECHA 2021
    - *In vitro:* A GLP compliant bacterial reverse mutation assay (OECD 471) was conducted utilizing *Salmonella typhimurium* tester strains TA98, TA100, TA1535, an TA1537 at concentrations of up to 5,000 µg/plate of 1-butoxypropan-2-ol (> 98% purity) in the presence and absence of metabolic activation. 1-Butoxypropan-2-ol was reported as negative for mutagenicity under all tested conditions (Klimisch Score 1, reliable without restriction).
    - *In vitro:* A second GLP compliant bacterial reverse mutation assay (OECD 471) was conducted utilizing *S. typhimurium* tester strains TA98, TA100, TA1535, TA1537, and TA1538 at concentrations of up to 17,600 µg/plate in the presence and absence of metabolic activation. A small increase in colonies was observed in TA 1535 in the top dose group. However, this result could not be repeated and no dose response relationship was established. Additionally, cytotoxic effects at the top dose may have interfered with results. The maximum recommended concentration for testing following OECD 471 is 5,000 µg/plate. Based on available data, ToxServices agrees with the study author's conclusion that 1-butoxypropan-2-ol was negative for mutagenicity under the tested conditions (Klimisch Score 1, reliable without restriction).
    - *In vitro:* A GLP compliant mouse lymphoma assay (OECD 476) was conducted utilizing L5178Y TK+/- mouse lymphoma cells at concentrations of up to 6,000 µg/ml in the presence and absence of metabolic activation. No increases in revertant cells were reported and 1-butoxypropan-2-ol was reported as negative for genotoxicity (Klimisch Score 1, reliable without restriction).
    - *In vitro:* A GLP compliant chromosomal aberration assay (OECD 473) was conducted utilizing Chinese Hamster Ovary (CHO) cells at concentrations of up to 5,000 µg/ml of 1-butoxypropan-2-ol (99.5% purity) in the presence and absence of metabolic activation. There were no statistically significant increases in the frequencies of chromosomal aberrations in cultures treated with 1-butoxypropan-2-ol in the absence or presence of S-9 as compared to the negative control cultures (Klimisch Score 1, reliable without restriction).
    - *In vitro:* A second GLP compliant chromosomal aberration assay (OECD 473) was conducted utilizing CHO cells at concentrations of up to 4,500 µg/ml of 1-butoxypropan-2-ol (99.5% purity) (+S9) and 6,000 µg/ml of 1-butoxypropan-2-ol (-S9) in the presence and absence of metabolic activation. 1-Butoxypropan-2-ol was reported as negative for clastogenicity under all tested conditions (Klimisch Score 1, reliable without restriction).
    - *In vitro:* A GLP compliant DNA damage and repair (unscheduled DNA synthesis, or UDS) assay was conducted utilizing primary rat hepatocytes at concentrations of up to 6,000 µg/ml. Cells were exposed to 1-butoxypropan-2-ol for 18 hours at 37°C. Nuclear grain counts were not increased in 1-butoxypropan-2-ol treated cells at any dose level and 1-butoxypropan-2-ol was reported as negative for genotoxicity under the tested conditions (Klimisch Score 1, reliable without restriction).

Reproductive Toxicity (R) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for reproductive toxicity based on lack of specific adverse reproductive effects observed for structurally similar surrogates PGME and DPnB. Additionally, both authors of Human and Environmental Risk Assessment on Ingredients of Household Products (HERA) and United Nations Environmental Programme (UNEP) concluded that no reproductive effects were expected based on the weight of evidence from structurally similar chemicals. GreenScreen® criteria classify chemicals as a Low hazard for reproductive toxicity when adequate

negative data are available and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on reliable data on strong surrogates.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - *Oral: Surrogate: DPnB (CAS #29911-28-2):* A GLP compliant combined repeated dose toxicity study with reproduction/developmental toxicity screening (OECD 422) was conducted using male and female Sprague-Dawley rats (12/sex/group). Rats were administered doses of 0, 100, 300 and 1,000 mg/kg of DPnB (99.34% purity) via gavage for two weeks prior to breeding up to postpartum day 4 in females and from two weeks before breeding until necropsy in males. Reproductive performance and reproductive organ weights were examined in parental animals. There were no-treatment related effects on any of the reproductive parameters reported by the study authors. A NOEL of 1,000 mg/kg was reported by study authors for reproductive toxicity of DPnB (Klimisch Score 1, reliable without restriction).
  - *Inhalation: Surrogate: PGME (CAS #107-98-2):* A GLP compliant two-generation reproductive toxicity study (OECD 416) was conducted using male and female Sprague-Dawley rats (30/sex/group). Rats were exposed to concentrations of 0, 300, 1,000, and 3,000 ppm of PGME (> 99.9% purity) via whole-body inhalation 5 days/week pre-mating and 7 days/week post-mating for 6 hours/day (equivalent to 0, 1.11, 3.69 and 11.07 mg/L, respectively, according to ECHA). P1 animals were mated after ~10 weeks of exposure to produce F1a litters. A week after weaning of F1a, P1 animals were mated again to produce F1b litters to confirm findings in F1a litters at the top dose. Exposure in F1a weanlings stopped between postnatal day 22 and postnatal day 28 so that the animals grew large and strong enough for reproduction. Exposure resumed on postnatal day 28 until evaluation of vaginal opening and preputial separation was completed and they were sacrificed afterwards. F1b litters were weaned on postnatal day 21 at which time exposure discontinued until postnatal day 28. They were exposed for another 10 weeks (P2) and then mated to produce F2 litters. Exposures to P1 and P2 adults continued until necropsy. In the top dose of both parental groups, sedation, incoordination, and decreased activity were observed in both sexes. However, effects were transient and no effects were observed by the next exposure. No other treatment-related observations regarding behavior or demeanor were observed. Significant decreases in body weights were measured in all parental animals in the top dose groups. Compensatory increases in body weights were measured during lactation for the F1 and F2 groups in the high-dose groups. Additionally, P1 and P2 females in the high dose group also exhibited lengthened estrous cycles, decreased fertility, decreased ovary weights and an increased incidence of histologic ovarian atrophy. However, these affects appeared to be secondary to the decreased body weights in high-dose females. No treatment-related differences in sperm counts or motility were observed among the parental males. Slight decreases in maternal body weights were observed in the mid-dose group with no corresponding reproductive effects. Study authors reported a NOAEL of 300 ppm (1.11 mg/L) for parental toxicity and 1,000 ppm (3.69 mg/L) for reproductive toxicity (Klimisch Score 2, reliable with restriction).
- UNEP 2003
  - Toxicity testing on 1-butoxypropan-2-ol has not been conducted. However, the two-generation reproductive toxicity test on PGME is reported as being directly applicable to 1-butoxypropan-2-ol by the UNEP. In addition, several well documented 90-day oral toxicity

studies have been reported for 1-butoxypropan-2-ol and no effects on reproductive organs have been reported.

- HERA 2005
    - No studies are available which suggest 1-butoxypropan-2-ol may cause reproductive or developmental toxicity.

Developmental Toxicity incl. Developmental Neurotoxicity (D) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for developmental toxicity based on the lack of developmental effects observed in well conducted studies in rats and rabbits. GreenScreen® criteria classify chemicals as a Low hazard for developmental toxicity when adequate negative data are available and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data on the target chemical and strong surrogates.

- Authoritative and Screening Lists
    - *Authoritative:* Not present on any authoritative lists for this endpoint.
    - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
    - *Oral: Surrogate: DPnB (CAS #29911-28-2):* A GLP compliant combined repeated dose toxicity study with reproduction/developmental toxicity screening (OECD 422) was conducted as previously described using male and female Sprague-Dawley rats (12/sex/group). Rats were administered doses of 0, 100, 300 and 1,000 mg/kg of DPnB (99.34% purity) via gavage for two weeks prior to breeding up to postpartum day 4 in females and from two weeks before breeding until necropsy in males. Litters sizes, pup survival, sex, body weights, and presence of gross external abnormalities were assessed. There were no-treatment related effects on any of the reproductive parameters reported by the study authors. A NOEL of 1,000 mg/kg was reported by study authors for developmental toxicity of DPnB (Klimisch Score 1, reliable without restriction).
    - *Inhalation: Surrogate: PGME (CAS #107-98-2):* A GLP compliant two-generation reproductive toxicity study (OECD 416) was conducted as previously described using male and female Sprague-Dawley rats (30/sex/group). Rats were exposed to concentrations of 0, 300, 1,000, and 3,000 ppm of PGME (> 99.9% purity) via whole-body inhalation 5 days/week pre-mating and 7 days/week post-mating for 6 hours/day (equivalent to 0, 1.11, 3.69 and 11.07 mg/L, respectively, according to ECHA). P1 animals were mated after ~10 weeks of exposure to produce F1a litters. A week after weaning of F1a, P1 animals were mated again to produce F1b litters to confirm findings in F1a litters at the top dose. Exposure in F1a weanlings stopped between postnatal day 22 and postnatal day 28 so that the animals grew large and strong enough for reproduction. Exposure resumed on postnatal day 28 until evaluation of vaginal opening and preputial separation was completed and they were sacrificed afterwards. F1b litters were weaned on postnatal day 21 at which time exposure discontinued until postnatal day 28. They were exposed for another 10 weeks (P2) and then mated to produce F2 litters. Exposures to P1 and P2 adults continued until necropsy. In the top dose of both parental groups, sedation, incoordination, and decreased activity were observed in both sexes. However, effects were transient and no effects were observed by the next exposure. No other treatment-related observations regarding behavior or demeanor were observed. Significant decreases in body weights were measured in all parental animals in the top dose groups. Compensatory increases in body weights were measured during lactation for the F1 and F2 groups in the high-dose groups. Neonatal effects in the top dose group consisted of reduced pup survival and litter size, increased time to vaginal opening or preputial separation, and histopathological observations in the liver

and thymus. These effects were considered secondary to maternal toxicity by the study authors. Slight decreases in maternal body weights were observed in the mid-dose group with no corresponding neonatal effects. Study authors reported a NOAEL of 300 ppm (1.11 mg/L) for parental toxicity and 1,000 ppm (3.69 mg/L) for offspring toxicity (Klimisch Score 2, reliable with restriction).

- *Dermal:* A GLP compliant developmental toxicity study (OECD 414) was conducted using female Wistar rats (20/group). Rats were administered doses of 0, 264 and 880 mg/kg of 1-butoxypropan-2-ol (> 98% purity) on days 6 through 16 of gestation via non-occluded dermal administration on the shaved back. No mortality or abnormalities in behavior or conditions occurred. No statistically significant differences in body weight, food intake, or weights of the ovaries, uterus, kidneys and liver were measured. No treatment related visceral or skeletal malformations were observed. The study authors reported that dermal administration of up to 880 mg/kg of 1-butoxypropan-2-ol did not induce maternal toxicity, embryo/fetal toxicity, or teratogenic effects. A NOAEL of 880 mg/kg was established by the study authors for developmental toxicity (Klimisch Score 1, reliable without restriction).
- *Dermal:* A second (GLP status not reported) developmental toxicity study (OECD 414) was conducted using New Zealand White rabbits (19/group). Rats were administered doses of 0, 10, 40, and 100 mg/kg of 1-butoxypropan-2-ol on days 7 through 18 of gestation via non-occluded dermal administration on the shaved back. There were no statistically significant differences for maternal body weight gain, feed consumption, number of corpora lutea per ovary, implantations, live fetuses, early and late resorptions, fetal body weights, gender, or gross external changes. There were no visceral or skeletal fetal alterations at any dose tested. No signs of maternal toxicity were observed. The developmental NOAEL was considered to be 100 mg/kg by the study authors (Klimisch Score 2, reliable with restriction).

- HERA 2005
  - No studies are available which suggest 1-butoxypropan-2-ol may cause developmental toxicity.

Endocrine Activity (E) Score (H, M, or L): DG

1-Butoxypropan-2-ol was assigned a score of Data Gap for endocrine activity based on insufficient data identified for this endpoint.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- U.S. EPA 2021
  - 1-Butoxypropan-2-ol was active in 1/10 estrogen receptor (ER) assays, 0/9 androgen receptor (AR) assays, 0/2 steroidogenesis assays, and 0/8 thyroid receptor assays performed as part of the U.S. EPA's Endocrine Disruptor Screening Program (EDSP) in the 21st Century (Appendix D).
  - 1-Butoxypropan-2-ol was predicted to be inactive for androgen receptor agonism, antagonism, and binding using the COMPARA (consensus) model in ToxCast (Appendix D).
- Based on the weight of evidence, a Data Gap was assigned. Although U.S. EPA's EDSP identified one active estrogen receptor model, ToxServices does not consider the results of the modeling and *in vitro* high throughput screening data to be sufficient evidence for lack endocrine activity.

Group II and II* Human Health Effects (Group II and II* Human)

Note: Group II and Group II* endpoints are distinguished in the v 1.4 Benchmark system (the asterisk indicates repeated exposure). For Systemic Toxicity and Neurotoxicity, Group II and II* are considered sub-endpoints. See GreenScreen® Guidance v1.4, Annex 2 for more details.

Acute Mammalian Toxicity (AT) (Group II) Score (vH, H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for acute toxicity based on reliable oral and dermal LD_{50} values greater than 2,000 mg/kg and an inhalation LC_{50} of > 7.5 mg/L, resulting in a lack of GHS classification. GreenScreen® criteria classify chemicals as a Low hazard for acute mammalian toxicity when adequate negative data are available and they are not GHS classified or classified to GHS Category 5 (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- Authoritative and Screening Lists
  - *Authoritative:* Not listed on any authoritative lists for this endpoint.
  - *Screening:* New Zealand – GHS – 6.1D (oral) – Acutely toxic – equivalent to GHS Category 4
  - *Screening:* New Zealand – GHS – 6.1E (dermal) – Acutely toxic – equivalent to GHS Category 5
- ECHA 2021 (studies with Klimisch scores of 3 (not reliable) or 4 (not assignable) were not included below).
  - *Oral*: LD_{50} of 3,300 mg/kg was identified for Wistar rats (GLP, OECD 401) (Klimisch 1, reliable without restriction).
  - *Oral*: LD_{50} of > 2,000 mg/kg was identified for Wistar rats (GLP, OECD 423) (Klimisch 1, reliable without restriction).
  - *Oral*: LD_{50} of 2,500 mg/kg was identified for Wistar rats (non-GLP, similar to OECD 401) (Klimisch 2, reliable with restrictions).
  - *Oral*: LD_{50} of 5,200 mg/kg was identified for Wistar rats (non-GLP, similar to OECD 401) (Klimisch 2, reliable with restrictions).
  - *Inhalation*: LC_{50} of > 651 ppm (3.5 mg/L) was identified for F344 rats (GLP, OECD 403) (Klimisch 1, reliable without restriction)
  - *Inhalation*: LC_{50} of > 1,381.58 ppm (7.5 mg/L[11]) was identified for rats (non-GLP, similar to OECD 402) (Klimisch 2, reliable with restrictions).
  - *Dermal*: LD_{50} of > 2,000 mg/kg was identified for Wistar rats (GLP, OECD 402) (Klimisch 1, reliable without restriction)
  - *Dermal*: LD_{50} of 1,400 mg/kg was identified for New Zealand White rabbits (non-GLP, similar to OECD 402) (Klimisch 2, reliable with restrictions).
  - *Dermal*: LD_{50} of 3,133 mg/kg was identified for New Zealand White rabbits (non-GLP, similar to OECD 402) (Klimisch 2, reliable with restrictions).
- HERA 2005
  - The data for 1-butoxypropan-2-ol supports low acute toxicity with oral and dermal LD_{50} value greater than 2,000 mg/kg and an inhalation LC_{50} greater than 3.5 mg/L.
- NZ EPA 2021
  - 1-Butoxypropan-2-ol was categorized to Classification 6.1D (O), which is equivalent to GHS Category 4, based on an oral LD_{50} of 1,900 mg/kg in rats. *ToxServices notes that this study is assigned a Klimisch score of 3 (not reliable) in ECHA (2021), due to lack of study*

[11] 1381.58 x MW/24,450 = 1381.58 x 132.2 / 24,450 = 7.5 mg/L

details reported. Therefore, ToxServices discounted this study and classification in the overall weight of evidence.

- Based on the weight of evidence, a score of Low was assigned. While one dermal study in New Zealand White rabbits reported an LD_{50} value of 1,400 mg/kg, which warrants a Moderate score, limited details were reported for this study, including the purity of the tested substance. Additionally, another study in the same strain of rabbits reported a much higher LD_{50} of 3,133 mg/kg. The overall weight of evidence suggests that 1-butoxypropan-2-ol is not an acute toxicant by oral, dermal and inhalation routes of exposure.

Systemic Toxicity/Organ Effects incl. Immunotoxicity (ST-single) (Group II) Score (vH, H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for systemic toxicity (single dose) based on lack of systemic toxicity, including respiratory irritation, in acute oral, dermal and inhalation studies. GreenScreen® criteria classify chemicals as a Low hazard for systemic toxicity (single dose) when adequate negative data are available and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021 (Note: Only studies with Klimisch scores of 1 were included below as other studies did not report detailed clinical findings.)
  - *Oral*: In the acute oral toxicity test that identified an oral LD_{50} greater than 3,300 mg/kg in Wistar rats, clinical signs of toxicity included weight loss, lethargy, coma, hypopnea, gasping, and dacryorrhea (excessive tearing). Rats were administered single oral doses of 1,800, 2,400, or 3,200 mg/kg 1-butoxypropan-2-ol (purity >98%). These were reversible in surviving animals within 2 days. Mortalities, occurring within one day of treatment, were observed at the mid (one female) and high (four females, one male) dose levels. Surviving animals had normal weight gains. Gross pathology findings included hemorrhage of the stomach and intestines, bloody or yellow content of the small intestines, bloody content of the bladder and bladder hyperemia. Doses at which these observations were made were not reported (Klimisch Score 1, reliable without restriction).
  - *Oral*: In the acute oral toxicity test that identified an oral LD_{50} greater than 2,000 mg/kg in Wistar rats, clinical signs of toxicity included poor general state, dyspnea, apathy, squatting posture, abdominal and lateral position, staggering, ataxia, atonia, paresis, narcotic-like state, absent pain and corneal reflex, piloerection, smeared fur, exsiccosis, lacrimation, and brown and yellow green discolored urine. These observations lasted until day 3 after exposure. There were no gross pathological findings in surviving animals (Klimisch Score 1, reliable without restriction).
  - *Inhalation*: In the acute inhalation toxicity study, an inhalation LD_{50} greater than 651 ppm was identified in Fischer 344 rats. No clinical signs of toxicity or treatment-related effects on body weight or gross pathology were reported (Klimisch Score 1, reliable without restriction).
  - *Dermal*: In the acute dermal toxicity test that identified a dermal LD_{50} greater than 2,000 mg/kg in Wistar rats, no mortalities, clinical signs of toxicity, or skin irritation were reported (Klimisch Score 1, reliable without restriction).

Systemic Toxicity/Organ Effects incl. Immunotoxicity (ST-repeat) (Group II*) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for systemic toxicity (repeated dose) as well-documented studies for oral, dermal, and inhalation exposure show only minimal effects at high doses, requiring no GHS categorization. GreenScreen® criteria classify chemicals as a Low hazard for systemic toxicity (single dose) when adequate negative data are available and they are not GHS classified (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - *Oral:* A GLP compliant 13-week toxicity study (OECD 408) was conducted using male and female F344 rats (10/sex/group). Rats were administered does of 0, 100, 350, and 1,000 mg/kg of 1-butoxypropan-2-ol (99.4% purity) in drinking water, daily, for 90 days. The following evaluations were conducted: clinical observations; functional observational battery; ophthalmological examination; hematology; clinical chemistry; and histopathology. In the top dose group absolute liver weights were increased in males and females, and absolute kidney weights were increased in females only. No corresponding histopathological effects were identified. Statistically significantly decreased red blood cell counts and hemoglobin levels were identified in top dose males. Additionally, decreased platelet counts were identified in high dose females. However, no corresponding hypertrophy or lesions in bone marrow or spleen were identified in any groups. In high dose males, a statistically significant decrease in sodium and chloride was identified, as well as increases in potassium, urea, cholesterol, and creatine phosphokinase. In the mid-dose a slight but statistically significant decrease in sodium and increase in potassium were noted. In females, only slightly increased urea and creatine phosphokinase were measured in the top dose group. ECHA authors assigned a NOAEL and LOAEL of 350 and 1,000 mg/kg, respectively, based on increased organ weights at the top dose (Klimisch Score 1, reliable without restriction).
  - *Oral:* A GLP compliant 14-day toxicity study (OECD 407) was conducted using male and female Sprague-Dawley rats (6/sex/dose). Rats were exposed to 0, 100, 200, and 400 mg/kg of 1-butoxypropan-2-ol (> 98% purity) via oral gavage daily for 14 days. The following observations were conducted: clinical observations; hematology; clinical chemistry; and histopathology. No mortality or clinically observable signs of toxicity were noted in any of the subjects. No effects on hematology, clinical chemistry, organ weights, gross or microscopic pathology were identified. Therefore, the study authors established a NOAEL of 400 mg/kg, based on lack of observed adverse effect in the highest dose group (Klimisch Score 1, reliable without restriction).
  - *Inhalation:* Three sub-acute inhalation toxicity studies (14-day and two 28-day studies) were identified using male and female Sprague-Dawley and F344 rats. Animals were exposed to up to 700 ppm of 1-butoxypropan-2-ol via whole body inhalation. Slight, but statistically significantly increased liver weights were measured in rats exposed to vapor concentrations of 1-butoxypropan-2-ol greater than 600 ppm (9 exposures to 31 days, 6-7hr/day). However, no corresponding histopathological effects were identified. The ECHA authors concluded that the effects were not toxicologically relevant and established a NOAEC of >

600 ppm (3.2 mg/L[12]) (all three studies were rated as Klimisch Score 1, reliable without restriction).

- *Dermal:* A GLP compliant 13-week toxicity study (OECD 411) was conducted using male and female Wistar rats (10/sex/dose). Rats were exposed to 0, 88, 264, and 880 mg/kg of 1-butoxypropan-2-ol (> 98% purity) following dermal application 5 days/week, for 13 weeks. The following evaluations were conducted: clinical observations; ophthalmological examination; hematology; clinical chemistry; urinalysis; and histopathology. Skin irritation was observed in all tested groups. No changes were found in clinical observations, ophthalmology, hematology, clinical chemistry, urinalyses, or histopathology. The ECHA authors reported a NOAEL of 880 mg/kg as no adverse treatment-related effects were identified (Klimisch Score 1, reliable without restriction).

- Based on the weight of evidence, a score of Low was assigned. No categorization is required following GHS criteria as only minimal effects were identified at dose levels well over the 100 and 200 mg/kg guidance values for subchronic oral and dermal studies, respectively (UN 2019).

Neurotoxicity (single dose, N-single) (Group II) Score (vH, H, M, or L): M

1-Butoxypropan-2-ol was assigned a score Moderate for neurotoxicity (single dose) based on well-documented studies for oral, dermal, and inhalation exposure showing reversible narcotic effects, and a GHS classification of Category 3 by GHS Japan for narcotic effects following a single exposure. GreenScreen® criteria classify chemicals as a Moderate hazard for neurotoxicity (single dose) when they are classified as GHS Category 3 specific target organ toxicants for narcotic effects following single exposure for any route of exposure (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- *Authoritative:* Not listed on any authoritative lists for this endpoint.
- *Screening:*
  - Japan – GHS – Specific target organs/systemic toxicity following single exposure – Category 3
    - This classification is based on evidence of narcotic effects in exposed rats (NITE 2008).
- ECHA 2021 (Note: Only studies with Klimisch score of 1 were included below as other studies did not report sufficient clinical findings.)
  - *Oral*: In the acute oral toxicity test that identified an oral LD_{50} greater than 3,300 mg/kg in Wistar rats, clinical signs of toxicity included weight loss, lethargy, coma, hypopnea, gasping, and dacryorrhea. These signs were reversible in surviving animals. Rats were administered single oral doses of 1,800, 2,400, or 3,200 mg/kg 1-butoxypropan-2-ol (purity >98%). Mortalities, occurring within one day of treatment, were observed at the mid (one female) and high (four females, one male) dose levels (Klimisch 1, reliable without restriction).
  - *Oral*: In the acute oral toxicity test that identified an oral LD_{50} greater than 2,000 mg/kg in Wistar rats, clinical signs of toxicity included poor general state, dyspnea, apathy, squatting posture, abdominal and lateral position, staggering, ataxia, atonia, paresis, narcotic-like state, absent pain and corneal reflex, piloerection, smeared fur, exsiccosis, lacrimation, and brown and yellow green discolored urine. These clinical signs were reversible by three days after exposure (Klimisch 1, reliable without restriction).

[12] 600 ppm x MW of 1-butoxypropan-2-ol / 24,450 = 600 x 132.2 / 24,450 = 3.2 mg/L

  - *Inhalation*: In the acute inhalation toxicity study, an inhalation LD_{50} greater than 651 ppm was identified in Fischer 344 rats. No clinical signs of toxicity or treatment-related effects on body weight or gross pathology were reported (Klimisch 1, reliable without restriction).
  - *Dermal*: In the acute dermal toxicity test that identified a dermal LD_{50} greater than 2,000 mg/kg in Wistar rats, no mortalities, clinical signs of toxicity, or skin irritation were reported (Klimisch 1, reliable without restriction).
- Based on the weight of evidence, available data from animal studies indicate that at high doses, potential adverse effects may occur. 1-Butoxypropan-2-ol is a narcotic and was classified to GHS Category 3 based on signs of lethargy and coma seen in rats by GHS-Japan. ToxServices determined that the available data support this GHS classification.

Neurotoxicity (repeated dose, N-repeated) (Group II*) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for neurotoxicity (repeated dose) based on the lack of adverse effects in a functional observational battery as part of a 90-day oral toxicity study, and only transient narcotic effects at 3,974 mg/kg following inhalation exposure of structurally similar surrogate PGME. GreenScreen® criteria classify chemicals as a Low hazard for neurotoxicity (repeated dose) when adequate and negative data and no GHS classification are available (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - *Oral:* A previously described GLP compliant 13-week toxicity study (OECD 408) was conducted using male and female F344 rats (10/sex/group). Rats were administered doses of 0, 100, 350, and 1,000 mg/kg of 1-butoxypropan-2-ol (99.4%) purity daily for 90 days in drinking water. The following evaluations were conducted: clinical observations; functional observational battery; ophthalmological examination; hematology; clinical chemistry; and histopathology. No adverse effects were identified in the functional observation battery. Based on available data, ToxServices assigns a NOAEL of 1,000 mg/kg for neurotoxicity (Klimisch Score 1, reliable without restriction).
  - *Inhalation: Surrogate: PGME (CAS #107-98-2):* A GLP compliant two-generation reproductive toxicity study (OECD 416) was conducted as previously described using male and female Sprague-Dawley rats (30/sex/group). Rats were exposed to concentrations of 0, 300, 1,000, and 3,000 ppm (equivalent to oral doses of 0, 396, 1,325 and 3,974 mg/kg) of PGME (> 99.9%) via whole-body inhalation 5 days/week pre-mating and 7 days/week post-mating for 6 hours/day. In the top dose of both parental groups, sedation, incoordination, and decreased activity were observed in both sexes. However, effects were transient and no effects were observed by the next exposure. No other treatment-related observations regarding behavior or demeanor were observed (Klimisch Score 2, reliable with restriction).
- Based on weight of evidence, a score of Low was assigned. Transient narcotic effects were noted following high dose exposure to the surrogate substance PGME via whole body inhalation in a two-generation study. Transient narcotic effects are consistent with a GHS Category 3 classification discussed in the single dose neurotoxicity section above and is not applicable to the repeat dose neurotoxicity section. A subchronic oral study on the target chemical included a functional observation battery which did not find treatment-related effects on the parameters tested. The NOAEL of 1,000 mg/kg/day is higher than the GHS guidance cutoff of 100 mg/kg/day. Therefore, no GHS classification is warranted.

Skin Sensitization (SnS) (Group II*) Score (H, M, or L): L

1-Butoxypropan-2-ol was assigned a score of Low for skin sensitization based on a lack of evidence of dermal sensitization in a well-conducted study in guinea pigs. GreenScreen® criteria classify chemicals as a Low hazard for skin sensitization when adequate and negative data and no GHS classification are available (CPA 2018b). The confidence in the score is high as it is based on a reliable study on the target compound.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - A GLP compliant Buehler test (OECD 406) was conducted using Hartley guinea pigs (n=20/sex not reported). Induction doses consisted of a volume of 0.3 ml of an 80% 1-butoxypropan-2-ol prepared with propylene glycol and applied to the clipped area on the dorsal surface under occlusive conditions for 6 hours at 0, 24, and 48 hours. The induction dose was determined by a prior irritation screen. The challenge dose consisted of a 40% 1-butoxypropan-2-ol solution applied to the induction site 14 days after final induction dose. No hypersensitivity reactions were observed. 1-Butoxypropan-2-ol was reported as negative for sensitization under the tested conditions by the study authors (Klimisch Score 1, reliable without restriction).
- UNEP 2003
  - Data from all tested chemicals in the propylene glycol ethers category consistently tested negative for skin sensitization.

Respiratory Sensitization (SnR) (Group II*) Score (H, M, or L): *L*

1-Butoxypropan-2-ol was assigned a score of Low for respiratory sensitization based on lack of skin sensitization potential and ECHA's guidance on respiratory sensitization evaluation (ECHA 2017). GreenScreen® criteria classify chemicals as a Low hazard for respiratory sensitization when adequate data are available and they are not classified under GHS (CPA 2018b). Confidence in the score is low as this evaluation does not include non-immunologic mechanisms of respiratory sensitization, and no specific data are available for respiratory sensitization.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- OECD 2020a
  - 1-Butoxypropan-2-ol does not contain any structural alerts for respiratory sensitization (Appendix E)
- Based on the weight of evidence and guidance from ECHA regarding assessment of respiratory sensitization potential, a score of Low was assigned. The guidance from ECHA states that the mechanisms leading to respiratory sensitization are essentially similar to those leading to skin sensitization (ECHA 2017). ECHA recommended that if a chemical is not a dermal sensitizer based on high quality data, it is unlikely to be a respiratory sensitizer. ECHA also noted that this rationale does not cover respiratory hypersensitivity caused by non-immunological mechanisms, for which human experience is the main evidence of activity (ECHA 2017). As 1-butoxypropan-2-ol was not sensitizing to the skin (see skin sensitization section above), and a literature search did not find any human evidence of respiratory sensitization by 1-butoxypropan-2-ol, and as 1-butoxypropan-2-ol does not contain any structural alerts for respiratory sensitization (OECD 2020a), 1-butoxypropan-2-ol is not expected to be a respiratory sensitizer.

Skin Irritation/Corrosivity (IrS) (Group II) Score (vH, H, M, or L): H

1-Butoxypropan-2-ol was assigned a score of High for skin irritation/corrosivity based on an authoritative list and measured data on undiluted 1-butoxypropan-2-ol. GreenScreen® criteria classify chemicals as a High hazard for skin irritation/corrosivity when they are associated with H315 based on a classification from the EU (CPA 2018b). The confidence in the score is high as it is based on an authoritative A list and experimental data.

- Authoritative and Screening Lists
  - *Authoritative:* EU – GHS (H-Statements) – H315 – Causes skin irritation
  - *Screening:* Japan – GHS – Skin corrosion/irritation – Category 2
  - *Screening:* Australia – GHS – H315 – Causes skin irritation
  - *Screening:* New Zealand – GHS – 6.3A – Irritating to the skin (Cat. 2)
- ECHA 2021 (Note: Only Klimisch Score 1 (reliable without restriction] studies are summarized below as they are adequate to assign a GreenScreen® score).
  - *In vivo:* A GLP compliant skin irritation study (OECD 404) was conducted in New Zealand White rabbits (3/animals). Undiluted 1-butoxypropan-2-ol was administered to shaved skin for 4 hours and observed for signs of irritation over the following 14 days. The site of application was evaluated for irritation by scoring erythema/eschar and edema. One subject had eschar over a large portion of the treated site which did not completely disappear by day 14. The remaining two subjects showed well-defined erythema and slight edema with scaliness that disappeared over the 14 day observation period. The mean erythema score was ≥ 2 for all animals. The study authors considered the test substance to be moderately irritating (Klimisch Score 1, reliable without restriction).
  - *In vivo:* A GLP compliant skin irritation study (OECD 404) was conducted in New Zealand White rabbits (3/animals). Undiluted 1-butoxypropan-2-ol was administered to shaved skin for 4 hours and observed for signs of irritation over the following 14 days. The site of application was evaluated for irritation by scoring erythema/eschar and edema. 1-Butoxypropan-2-ol was found to have a primary irritation index of 4 (2.66 for erythema/eschar plus 1.33 for edema) averaged for the three animals at 24 and 72 hours. One subject had eschar over a large portion of the treated site, which did not completely disappear by day 14. This subject also exhibited chronic dermal irritation on day 14. The remaining two subjects showed well-defined erythema and slight edema with scaliness (days 2 and 3) that disappeared over the 14-day observation period. The study authors considered the test substance to be moderately irritating (Klimisch Score 1, reliable without restriction).
  - *In vivo:* A GLP compliant skin irritation study (OECD 404) was conducted in New Zealand White rabbits (3/animals). Concentrations of 25%, 50%, and 75% 1-butoxypropan-2-ol in water were administered to shaved skin for 4 hours and observed for signs of irritation over the following 7 days. The site of application was evaluated for irritation by scoring erythema/eschar and edema. At the 75% concentration, 1-butoxypropan-2-ol was found to have a mean erythema score > 2, indicating skin irritation potential. Scores were zero by day 7 when the study was terminated. At 50% and 25% concentrations in water, the mean erythema and edema scores were < 2 for all animals. Skin irritation disappeared by day 7 in all groups. The study authors considered the test substance to be irritating to the skin (Klimisch Score 1, reliable without restriction).
  - *In vivo:* A GLP compliant skin irritation study (OECD 404) was conducted in New Zealand White rabbits (3/animals). Concentrations of 25%, 50%, and 75% 1-butoxypropan-2-ol in water were administered to shaved skin for 4 hours and observed for signs of irritation over the following 7 days. The site of application was evaluated for irritation by scoring erythema/eschar and edema. At 75% concentration, 1-butoxypropan-2-ol was found to have

a primary irritation index (PII) of 2.5 (1.83 for erythema/ eschar plus 0.66 for edema) averaged for the three animals at 24 and 72 hours, indicating moderate irritation potential. Scores were zero by day 7 when the study was terminated. At 50%, the PII for 1-butoxypropan-2-ol was 0.8, indicating slight irritation. At 25% concentration in water, the PII for 1-butoxypropan-2-ol was 0. Skin irritation disappeared by day 7 in all groups. The study authors considered the test substance to be moderately irritating (Klimisch Score 1, reliable without restriction).

  - *In vivo:* A GLP compliant skin irritation study (OECD 404) was conducted in New Zealand White rabbits (3/animals). Undiluted 1-butoxypropan-2-ol was administered to clipped skin for 4 hours and observed for signs of irritation over the following 8 days. The site of application was evaluated for irritation by scoring erythema/eschar and edema. The mean erythema scores over hours 24-72 were 1.6 and the mean edema score was 0. Therefore, the study authors considered the test substance to be non-irritating to the skin (Klimisch Score 1, reliable without restriction).

- UNEP 2003
  - 1-Butoxypropan-2-ol is moderately irritating to the skin.
- HERA 2005
  - 1-Butoxypropan-2-ol is considered to be moderately irritating to the skin.

Eye Irritation/Corrosivity (IrE) (Group II) Score (vH, H, M, or L): H

1-Butoxypropan-2-ol was assigned a score of High for eye irritation/corrosivity based on an authoritative list, supported available data classified it to GHS Category 2A, which also warrants a High score. GreenScreen® criteria classify chemicals as a High hazard for eye irritation/corrosivity when they are associated with H319 based on a classification from the EU (CPA 2018b). The confidence in the score is high as it is based on an authoritative A listing.

- Authoritative and Screening Lists
  - *Authoritative:* EU – GHS (H-Statements) – H319 – Causes serious eye irritation
  - *Screening:* Australia – GHS – H319 – Causes serious eye irritation
  - *Screening:* New Zealand – GHS – 6.4A – Irritating to the eye (Cat. 2A)
  - *Screening:* Japan – GHS – Serious eye damage/eye irritation – Category 2B
- ECHA 2021
  - *In vivo:* A GLP compliant eye irritation study (OECD 405) was conducted using female New Zealand white rabbits (n=3). 0.1 ml of undiluted 1-butoxypropan-2-ol (> 98% purity) was instilled into the left conjunctival sac and the lids were held together for a few seconds after instillation. The test solution was rinsed 30 seconds following treatment. Following treatment conjunctival redness was identified with an average score of 2.3 out of 3 and was reversible within 14 days. Only slight corneal opacity and iritis were observed and were reversible within 48 hours (Klimisch Score 1, reliable without restriction). *Following GHS criteria, a score of > 2 for conjunctival redness that is fully reversible in 21 days is classified as a GHS Category 2A eye irritant.*
  - *In vivo:* A GLP compliant eye irritation study (OECD 405) was conducted using female New Zealand white rabbits (n=3). 0.1 ml of undiluted 1-butoxypropan-2-ol (purity not specified) was instilled into the eye and the animals were observed for 7 days. Moderate to severe conjunctival redness, slight to marked conjunctival swelling, moderate to severe discharge and slight corneal opacity were observed in all animals during the course of the study. Moderate to severe iritis was seen in 2 animals. Small retractions in the eyelids, suppuration and discharge of blood were noted over the study period. The ocular reactions

were reversible in all animals within 7 days after application. The study authors considered the test substance to be irritating to the eyes (Klimisch Score 2, reliable with restriction).
    - *In vivo:* A non-GLP compliant eye irritation study (OECD 405) was conducted in rabbits (sex and species not specified). 1-Butoxypropan-2-ol was instilled in the eye and animals were observed (observation period not specified). Corneal injury in rabbits was scored as a 7/10 on a 10-grade ordinal series test for eye injury and is based on corneal necrosis resulting for installation of various volumes and concentrations of the target chemical. The study authors concluded that the test substance is not an eye irritant (Klimisch Score 2, reliable without restriction).
- UNEP 2003
    - 1-Butoxypropan-2-ol is moderately irritating to the eyes.
- HERA 2005
    - 1-Butoxypropan-2-ol is considered to be moderately irritating to the eyes.

Ecotoxicity (Ecotox)

Acute Aquatic Toxicity (AA) Score (vH, H, M, or L): L
1-Butoxypropan-2-ol was assigned a score of Low for acute aquatic toxicity based on available L/EC_{50} values being above the 100 mg/L cut-off for low toxicity. GreenScreen® criteria classify chemicals as a Low hazard for acute aquatic toxicity when aquatic toxicity values are greater than 100 mg/L (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data on all three trophic levels.

- Authoritative and Screening Lists
    - *Authoritative:* Not present on any authoritative lists for this endpoint.
    - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
    - A LC_{50} value of greater than 560 mg/L was identified for *Poecilia reticulata* (Guppy fish, 96-hr) (OECD 203) (Klimisch Score 1, reliable without restriction).
    - A LC_{50} value of 1,060 mg/L was identified for *Pimephales promelas* (Fathead minnow , 96-hr) (no guideline) (Klimisch Score 2, reliable with restriction).
    - An EC_{50} value of greater than 1,000 mg/L was identified for *Daphnia magna* (invertebrate, 48-hr) (OECD 202) (Klimisch Score 1, reliable without restriction).
    - An EC_{50} value of greater than 100 mg/L was identified for *D. magna* (invertebrate, 48-hr) (OECD 202) (Klimisch Score 1, reliable without restriction).
    - An EC_{50} value of 1,436 mg/L was identified for *D. magna* (invertebrate, 48-hr) (OECD 202) (Klimisch Score 2, reliable with restriction).
    - An EC_{50} value of greater than 1,000 mg/L was identified for *Selenastrum capricornutum* (algae, 96-hr) (no guideline) (Klimisch Score 2, reliable with restriction).

Chronic Aquatic Toxicity (CA) Score (vH, H, M, or L): *L*
1-Butoxypropan-2-ol was assigned a score of Low for chronic aquatic toxicity based on available modeled ChV values being greater than 10 mg/L. GreenScreen® criteria classify chemicals as a Low hazard for chronic aquatic toxicity when chronic aquatic toxicity values are greater than 10 mg/L or no effects are observed at saturation (CPA 2018b). The confidence in the score is low as it is partially based on modeled data for fish and invertebrates.

- Authoritative and Screening Lists
    - *Authoritative:* Not present on any authoritative lists for this endpoint.
    - *Screening:* Not present on any screening lists for this endpoint.

- ECHA 2021
    - A NOEC value of 560 mg/L was identified for *S. capricornutum* (algae, 96-hr) (no guideline) (Klimisch Score 2, reliable with restriction).
- U.S. EPA 2017a
    - 1-Butyoxypropan-2-ol belongs to the neutral organics ECOSAR chemical class. The most conservative predicted chronic values (ChVs) are 50.88 mg/L in fish, 23.78 mg/L in daphnia, and 36.52 mg/L in green algae (Appendix F).

Environmental Fate (Fate)

Persistence (P) Score (vH, H, M, L, or vL): vL

1-Butoxypropan-2-ol was assigned a score of Very Low for persistence based on meeting the 10-day window in ready biodegradability studies. GreenScreen® criteria classify chemicals as a Very Low hazard for when they meet the 10-day window in ready biodegradability studies and mainly partition to water, soil, or sediment (CPA 2018b). The confidence in the score is high as it is based on high quality, measured data.

- Authoritative and Screening Lists
    - *Authoritative:* Not present on any authoritative lists for this endpoint.
    - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
    - A GLP compliant CO_2 Headspace Test (ISO 14593) was conducted under aerobic conditions using non-adapted domestic activated sludge. An initial test concentration of 32.4 mg/L was used. Under the tested conditions 1-butoxypropan-2-ol had a reported biodegradation rate of 67-68% after 7 days and 82-86% after 28 days. The pass level was met within the 10-day window (Klimisch Score 1, reliable without restriction).
    - A GLP compliant Modified OECD Screening Test (OECD 301E) was conducted under aerobic conditions using fresh activated sludge filtrate. An initial concentration of 28 mg/L 1-butoxypropan-2-ol was used. Under the tested conditions 1-butoxypropan-2-ol had reported biodegradation rate of 89.2% at 14 days and 90% at 28 days. Based on the degradation rates over the course of the study period, the 10-day window was met. 1-Butoxypropan-2-ol was considered to be readily biodegradable under the tested conditions by the ECHA authors (Klimisch Score 1, reliable without restriction).
    - A GLP compliant CO_2 Evolution Test (OECD 301B) was conducted under aerobic conditions using sediment and activated sludge from a domestic treatment plant. An initial test concentration of 19.89 mg/L was used. Under the tested conditions 1-butoxypropan-2-ol had a reported biodegradation rate of 67% after 28 days. 1-Butoxypropan-2-ol was reported as biodegradable but did not meet the 10-day window (Klimisch Score 1, reliable without restriction).
    - A GLP compliant Closed Bottle Test (OECD 301D) was conducted under aerobic conditions using domestic sewage. An initial test concentration of 9.29 mg/L was used. Under the tested conditions 1-butoxypropan-2-ol had a reported biodegradation rate of 60.5% after 28 days. 1-Butoxypropan-2-ol was reported as biodegradable but did not meet the 10-day window (Klimisch Score 1, reliable without restriction).
- U.S. EPA 2017b
    - EPI Suite™ BIOWIN modeling predicts that 1-butoxypropan-2-ol is readily biodegradable. Level III fugacity modeling (MCI method) predicts that 58% will partition to soil with a half-life of 416 hours (17.3 days), 40.6% will partition to water with a half-life of 208 hours (8.7 days), and 1.34% to air with a half-life of 6.83 hours (Appendix G).

Bioaccumulation (B) Score (vH, H, M, L, or vL): vL
1-Butoxypropan-2-ol was assigned a score of Very Low for bioaccumulation based on a modeled BCF of less than 100 and experimental log K_{ow} values of 1.15-1.20. GreenScreen® criteria classify chemicals as a Very Low hazard for bioaccumulation when BCF/BAF values are less than 100 or the log K_{ow} is no greater than 4 (CPA 2018b). The confidence in the score is high as the modeled values are supported by measured log K_{ow} values.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - A log K_{ow} of 1.2 at 20°C was reported for 1-butoxypropan-2-ol.
- HERA 2005
  - A log K_{ow} of 1.15 was reported for 1-butoxypropan-2-ol.
- U.S. EPA 2017b
  - BCFBAF predicts a BCF/BAF of 2.876 L/kg wet-wt using the regression based model based on a measured log K_{ow} of 1.2, and a BCF of 2.086 using the Arnot-Gobas model for the upper trophic level, taking metabolism into consideration (Appendix F).

Physical Hazards (Physical)

Reactivity (Rx) Score (vH, H, M, or L): *L*
1-Butoxypropan-2-ol was assigned a score of Low for reactivity based on lack of structural alerts indicating it is oxidizing and explosive properties. GreenScreen® criteria classify chemicals as a Low hazard for reactivity when they are not explosive or self-reactive (CPA 2018b). The confidence in the score was low due to a lack of measured data.

- Authoritative and Screening Lists
  - *Authoritative:* Not present on any authoritative lists for this endpoint.
  - *Screening:* Not present on any screening lists for this endpoint.
- ECHA 2021
  - 1-Butoxypropan-2-ol is not explosive and does not have oxidizing properties.
- UN 2019
  - Based on the structure of its components or moieties, 1-butoxypropan-2-ol is not considered explosive or self-reactive due to lack of functional groups associated with explosive or self-reactive properties (See Appendix H).
  - Based on the structure of its components or moieties, 1-butoxypropan-2-ol is not considered to have oxidizing properties as it does not contain any structural groups known to be correlated with a tendency to react exothermally with combustible materials.

Flammability (F) Score (vH, H, M, or L): M
1-Butoxypropan-2-ol was assigned a score of Moderate for flammability based on categorization as a GHS Category 4 Flammable Liquid. GreenScreen® criteria classify chemicals as a Moderate hazard for flammability when the chemical is classified to GHS Category 3 or 4 (CPA 2018b). Confidence in the score is high because it is based on experimental data.

- Authoritative and Screening Lists
  - *Authoritative:* Not listed on any authoritative lists for this endpoint.
  - *Screening:* Japan – GHS – Flammable liquids – Category 4
  - *Screening:* New Zealand – GHS – 3.1C – Flammable Liquids: Medium Hazard

- ECHA 2021
    - 1-Butoxypropan-2-ol was not ignited upon contact with air. Therefore, it was not considered a pyrophoric liquid. No further information was provided.
    - 1-Butoxypropan-2-ol has a reported flashpoint of 62.5°C in a closed cup test conducted according to ISO 2719.
    - 1-Butoxypropan-2-ol has a flash point of 59.5 – 60ºC according to a closed cup test conducted according to DIN EN ISO 13736.
- According to GHS criteria, flash points of between 60 and 93ºC classify chemicals as GHS Category 4 flammable liquids (UN 2019).

Use of New Approach Methodologies (NAMs)[13] in the Assessment, Including Uncertainty Analyses of Input and Output

New Approach Methodologies (NAMs) used in this GreenScreen® include *silico* modeling for endocrine activity, respiratory sensitization, chronic aquatic toxicity, and bioaccumulation, and *in vitro* assays for mutagenicity and endocrine activity. NAMs are non-animal alternatives that can be used alone or in combination to provide information for safety assessment (Madden et al. 2020). At present, there is not a uniformly accepted framework on how to report and apply individual NAMs (U.S. EPA 2020b, OECD 2020b). The expanded application of NAMs greatly amplifies the need to communicate uncertainties associated with their use. As defined by EFSA (2018), uncertainty is "a general term referring to all types of limitations in available knowledge that affect the range and probability of possible answers to an assessment question." The quality, utility, and accuracy of NAM predictions are greatly influenced by two primary types of uncertainties (OECD 2020b):

- Type I: Uncertainties related to the input data used
- Type II: Uncertainties related to extrapolations made

As shown in Table 5, Type I (input data) uncertainties in 1-butoxypropan-2-ol's NAMs dataset include no experimental or human data for endocrine activity, respiratory sensitization, and two trophic levels of chronic aquatic toxicity. In addition, the OECD UDS assay guideline has been deleted due to poor performance and lack of use. 1-Butoxypropan-2-ol's Type II (extrapolation output) uncertainties include limitation of *in vitro* genotoxicity assays in mimicking *in vivo* metabolism, their focusing on one or only a few types of genotoxicity events, the lack of applicability domains for ToxCast models for endocrine activity and OECD Toolbox for respiratory sensitization, the limitation of respiratory sensitization structural alerts in not accounting for non-immunologic mechanisms of respiratory sensitization, and the uncertain *in vivo* relevance of *in vitro* high throughput screening assays for endocrine activity. Some of 1-butoxypropan-2-ol's type II uncertainties were alleviated by the use of *in vitro* test batteries and/or in combination of *in vivo* data.

Table 5: Summary of NAMs Used in the GreenScreen® Assessment, Including Uncertainty Analyses

Uncertainty Analyses (OECD 2020b)	
Type I Uncertainty: Data/Model Input	**Genotoxicity:** The UDS assay method (OECD Guideline 482) has been deleted due to lack of use and poorer performance compared to other standard tests.[14] **Endocrine activity:** No *in vivo* experimental data are available. **Respiratory sensitization**: No experimental data are available and there are no validated test methods. **Chronic aquatic toxicity**: No experimental data are available for two trophic levels.
Type II Uncertainty: Extrapolation Output	**Genotoxicity:** The bacterial reverse mutation assay (as defined in OECD Guideline 471) only tests point-mutation inducing activity in non-mammalian cells, and the exogenous metabolic activation

[13] NAMs refers to any non-animal technology, methodology, approach, or combination thereof that inform chemical hazard and risk assessments. NAMs include *in silico*/computational tools, *in vitro* biological profiling (e.g., cell cultures, 2,3-D organotypic culture systems, genomics/transcriptomics, organs on a chip), and frameworks (i.e., adverse outcome pathways (AOPs), defined approaches (DA), integrated approaches to testing and assessment (IATA).
[14] https://www.oecd.org/env/ehs/testing/Draft_Intro_Genotoxicity%20TGs%20September%202014.pdf

	system does not entirely mimic *in vivo* conditions[15]. The mammalian cell gene mutation assay (as defined in OECD Guideline 476) only detects gene mutations, and the exogenous metabolic activation system does not entirely mirror *in vivo* metabolism (i.e., the liver S9 mix contains enzymes present in the endoplasmic reticulum but not the cytosol of liver cells).[16] The *in vitro* chromosome aberration assay (OECD 473) does not measure aneuploidy and it only measures structural chromosomal aberrations. The exogenous metabolic activation system does not entirely mirror *in vivo* metabolism[17]. The *in vitro* UDS assay detects "longpatch repair" but is less sensitive for detection of "shortpatch repair". Mutagenic events may result from non-repair, misrepair, of misreplication of DNA lesions, and UDS gives no indication of fidelity of the repair process. It is possible that a mutagen interacts with DNA but damage is not repaired by an excision repair process.[18] **Endocrine activity:** ToxCast models don't define applicability domains; the *in vivo* relevance of EDSP Tox 21 screening assays is unknown due to lack of consideration of metabolism and other toxicokinetic factors. **Respiratory sensitization**: The OECD Toolbox only identifies structural alerts, and does not define applicability domains. Additionally, the ECHA guidance (2017), on which the use of OECD Toolbox structural alerts is based, does not evaluate non-immunologic mechanisms for respiratory sensitization.
Endpoint	**NAMs Data Available and Evaluated? (Y/N)**	**Types of NAMs Data (*in silico* modeling/*in vitro* biological profiling/frameworks)**
Carcinogenicity	N	
Mutagenicity	Y	*In vitro* data: Bacterial reverse mutation assay/*in vitro* gene mutation assay/*in vitro* chromosome aberration assay/*in vitro* UDS assay
Reproductive toxicity	N	
Developmental toxicity	N	
Endocrine activity	Y	*In vitro* high throughput data: EDSP Tox 21 screening assays; *In silico* modeling: ToxCast models
Acute mammalian toxicity	N	

[15] https://www.oecd-ilibrary.org/docserver/9789264071247-en.pdf?expires=1614097593&id=id&accname=guest&checksum=89925F80B9F4BD2FFC6E90F94A0EE427
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Single exposure systemic toxicity	N	
Repeated exposure systemic toxicity	N	
Single exposure neurotoxicity	N	
Repeated exposure neurotoxicity	N	
Skin sensitization	N	
Respiratory sensitization	Y	*In silico* modeling: OECD Toolbox structural alerts
Skin irritation	N	
Eye irritation	N	
Acute aquatic toxicity	N	
Chronic aquatic toxicity	Y	*In silico* modeling: ECOSAR
Persistence	Y	Non-animal testing: OECD 301B, 301D, 301E, and ISO 14593 Biodegradation tests
Bioaccumulation	Y	*In silico* modeling: EPI Suite™

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APPENDIX A: Hazard Classification Acronyms
(in alphabetical order)

(AA) Acute Aquatic Toxicity

(AT) Acute Mammalian Toxicity

(B) Bioaccumulation

(C) Carcinogenicity

(CA) Chronic Aquatic Toxicity

(D) Developmental Toxicity

(E) Endocrine Activity

(F) Flammability

(IrE) Eye Irritation/Corrosivity

(IrS) Skin Irritation/Corrosivity

(M) Mutagenicity and Genotoxicity

(N) Neurotoxicity

(P) Persistence

(R) Reproductive Toxicity

(Rx) Reactivity

(SnS) Sensitization- Skin

(SnR) Sensitization- Respiratory

(ST) Systemic/Organ Toxicity

APPENDIX B: Results of Automated GreenScreen® Score Calculation for 1-Butoxypropan-2-ol (CAS #5131-66-8)

TOXSERVICES
TOXICOLOGY RISK ASSESSMENT CONSULTING

GreenScreen® Score Inspector

Table 1: Hazard Table

			Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
			Carcinogenicity	Mutagenicity/Genotoxicity	Reproductive Toxicity	Developmental Toxicity	Endocrine Activity	Acute Toxicity	Systemic Toxicity		Neurotoxicity		Skin Sensitization*	Respiratory Sensitization*	Skin Irritation	Eye Irritation	Acute Aquatic Toxicity	Chronic Aquatic Toxicity	Persistence	Bioaccumulation	Reactivity	Flammability
Table 2: Chemical Details									S	R *	S	R *	*	*								
Inorganic Chemical?	**Chemical Name**	**CAS#**	**C**	**M**	**R**	**D**	**E**	**AT**	**STs**	**STr**	**Ns**	**Nr**	**SNS***	**SNR***	**IrS**	**IrE**	**AA**	**CA**	**P**	**B**	**Rx**	**F**
No	1-Butoxypropan-2-ol	5131-66-8	L	L	L	L	DG	L	L	L	M	L	L	*L*	H	H	L	*L*	vL	vL	*L*	M

Table 3: Hazard Summary Table

Benchmark	a	b	c	d	e	f	g
1	No	No	No	No	No		
2	No	No	No	No	No	No	No
3	No	No	Yes	Yes			
4	STOP						

Table 4

Chemical Name	Preliminary GreenScreen® Benchmark Score
1-Butoxypropan-2-ol	3

Note: Chemical has not undergone a data gap assessment. Not a Final GreenScreen™ Score

Table 6

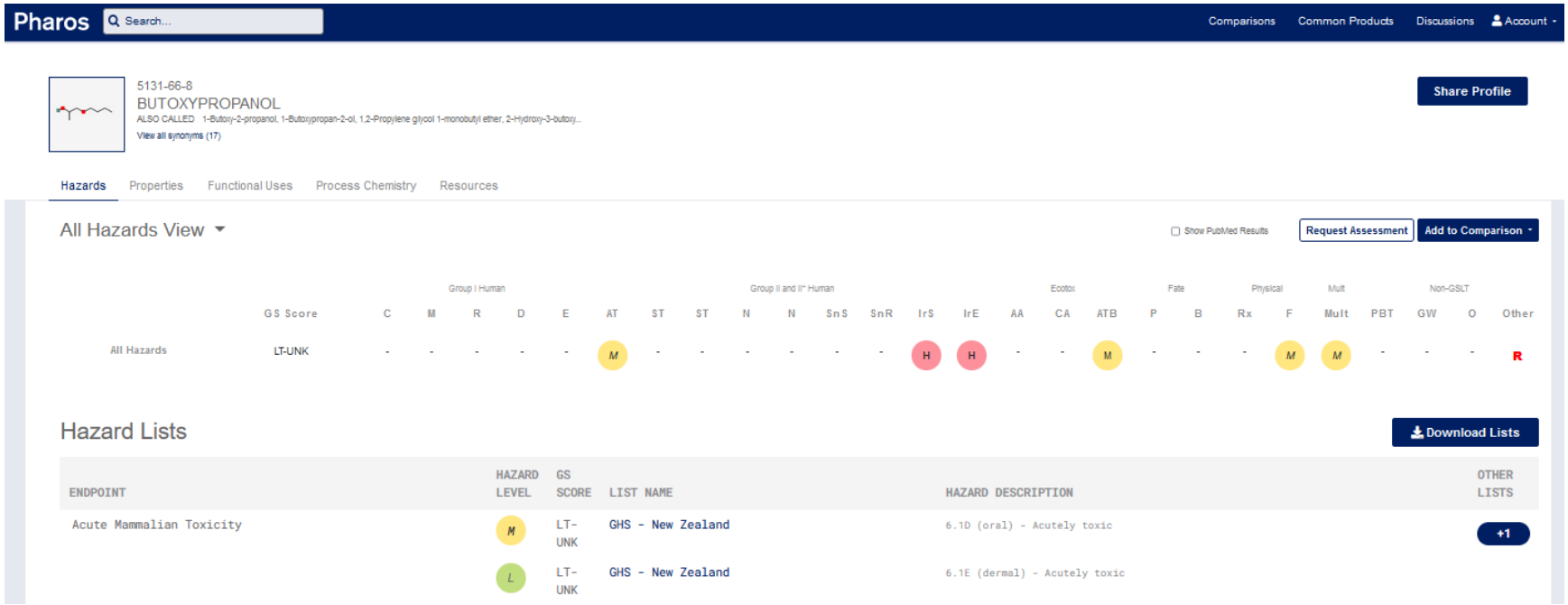
Chemical Name	Final GreenScreen® Benchmark Score
1-Butoxypropan-2-ol	3

After Data gap Assessment
Note: No Data gap Assessment Done if Preliminary GS Benchmark Score is 1.

Table 5: Data Gap Assessment Table

Datagap Criteria	a	b	c	d	e	f	g	h	i	j	bm4	End Result
1												
2												
3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		3
4												

APPENDIX C: Pharos Output for 1-Butoxypropan-2-ol (CAS #5131-66-8)



Skin Irritation/Corrosivity	H	LT-UNK	EU - GHS (H-Statements)	H315 - Causes skin irritation	+4
	H	LT-UNK	GHS - Japan	Skin corrosion / irritation - Category 2 [H315]	
	H	LT-UNK	GHS - Australia	H315 - Causes skin irritation	
	H	LT-UNK	GHS - New Zealand	6.3A - Irritating to the skin (Cat. 2)	
	pC	NoGS	EU - Manufacturer REACH hazard submissions	H315 - Causes skin irritation (unverified)	
Eye Irritation/Corrosivity	H	LT-UNK	EU - GHS (H-Statements)	H319 - Causes serious eye irritation	+4
	H	LT-UNK	GHS - Australia	H319 - Causes serious eye irritation	
	H	LT-UNK	GHS - New Zealand	6.4A - Irritating to the eye (Cat. 2A)	
	M	LT-UNK	GHS - Japan	Serious eye damage / eye irritation - Category 2B [H319]	
	pC	NoGS	EU - Manufacturer REACH hazard submissions	H319 - Causes serious eye irritation (unverified)	
Terrestrial Ecotoxicity	M	NoGS	GHS - New Zealand	9.3C - Harmful to terrestrial vertebrates	
Flammability	M	LT-UNK	GHS - Japan	Flammable liquids - Category 4 [H227]	+3
	M	LT-UNK	GHS - New Zealand	3.1C - Flammable Liquids: medium hazard	
	M	LT-UNK	Québec CSST - WHMIS 1988	Class B3 - Combustible liquids	
	pC	NoGS	EU - Manufacturer REACH hazard submissions	H226 - Flammable liquid and vapour (unverified)	
Human and/or Aquatic toxicity and/or Persistence and/or Bioaccumulation	U	LT-UNK	German FEA - Substances Hazardous to Waters	Class 1 - Low Hazard to Waters	
Carcinogenicity,Mutagenicity/Genotoxicity Reproductive Toxicity, Developmental Toxicity, Acute Mammalian Toxicity, or System Toxicity/Organ Effects.	U	LT-UNK	Québec CSST - WHMIS 1988	Class D2B - Toxic material causing other toxic effects	

Carcinogenicity,Mutagenicity/Genotoxicity Reproductive Toxicity, Developmental Toxicity, Acute Mammalian Toxicity, or System Toxicity/Organ Effects.	U	LT-UNK	Québec CSST - WHMIS 1988	Class D2B - Toxic material causing other toxic effects
Systemic Toxicity/Organ Effects [Single Exposure] and/or Neurotoxicity [Single Exposure]	M	LT-UNK	GHS - Japan	Specific target organs/systemic toxicity following single exposure - Category 3 [H335 or H336]

Restricted Substance Lists (2)

- Credo Beauty's Restricted Substance List: Prohibited Chemicals
- EU - PACT-RMOA Substances: Substances selected for RMOA or hazard assessment

Positive Lists (3)

- Cosmetic Ingredient Review (CIR): Safe with Qualifications
- TCO Certified Accepted Substance List: Draft - Accepted Substance List for Process Chemicals (tentative - awaiting assessment)
- US EPA - DfE SCIL: Green Circle - Verified Low Concern

Discussions

No discussions have been posted yet.

Ask a question about this chemical in the forums >

APPENDIX D: EDSP 21 Screening Data and ToxCast Endocrine Activity Predictions for 1-Butoxypropan-2-ol (CAS #5131-66-8)

Set: ER **(0 of 10 selected)**

- ACEA_ER_80hr
- ACEA_ER_AUC_viability
- ATG_ERa_TRANS_up
- ATG_ERE_CIS_up
- TOX21_ERa_BLA_Agonist_ratio
- TOX21_ERa_BLA_Antagonist_ratio
- TOX21_ERa_BLA_Antagonist_viability
- TOX21_ERa_LUC_VM7_Agonist
- TOX21_ERa_LUC_VM7_Antagonist_0.5nM_E2
- TOX21_ERa_LUC_VM7_Antagonist_0.5nM_E2_via

Set: AR **(0 of 9 selected)**

- ATG_AR_TRANS_up
- TOX21_AR_BLA_Agonist_ratio
- TOX21_AR_BLA_Antagonist_ratio
- TOX21_AR_BLA_Antagonist_viability
- TOX21_AR_LUC_MDAKB2_Agonist
- TOX21_AR_LUC_MDAKB2_Antagonist_0.5nM_R1
- TOX21_AR_LUC_MDAKB2_Antagonist_0.5nM_R1
- TOX21_AR_LUC_MDAKB2_Antagonist_10nM_R18
- TOX21_AR_LUC_MDAKB2_Antagonist_10nM_R18

Set: Thyroid **(0 of 8 selected)**

- ATG_THRa1_TRANS_dn
- ATG_THRa1_TRANS_up
- TOX21_TR_LUC_GH3_Agonist
- TOX21_TR_LUC_GH3_Antagonist
- TOX21_TR_LUC_GH3_Antagonist_viability
- TOX21_TSHR_Agonist_ratio
- TOX21_TSHR_Antagonist_ratio
- TOX21_TSHR_wt_ratio

Set: Steroidogenesis **(0 of 2 selected)**

- TOX21_Aromatase_Inhibition
- TOX21_Aromatase_Inhibition_viability

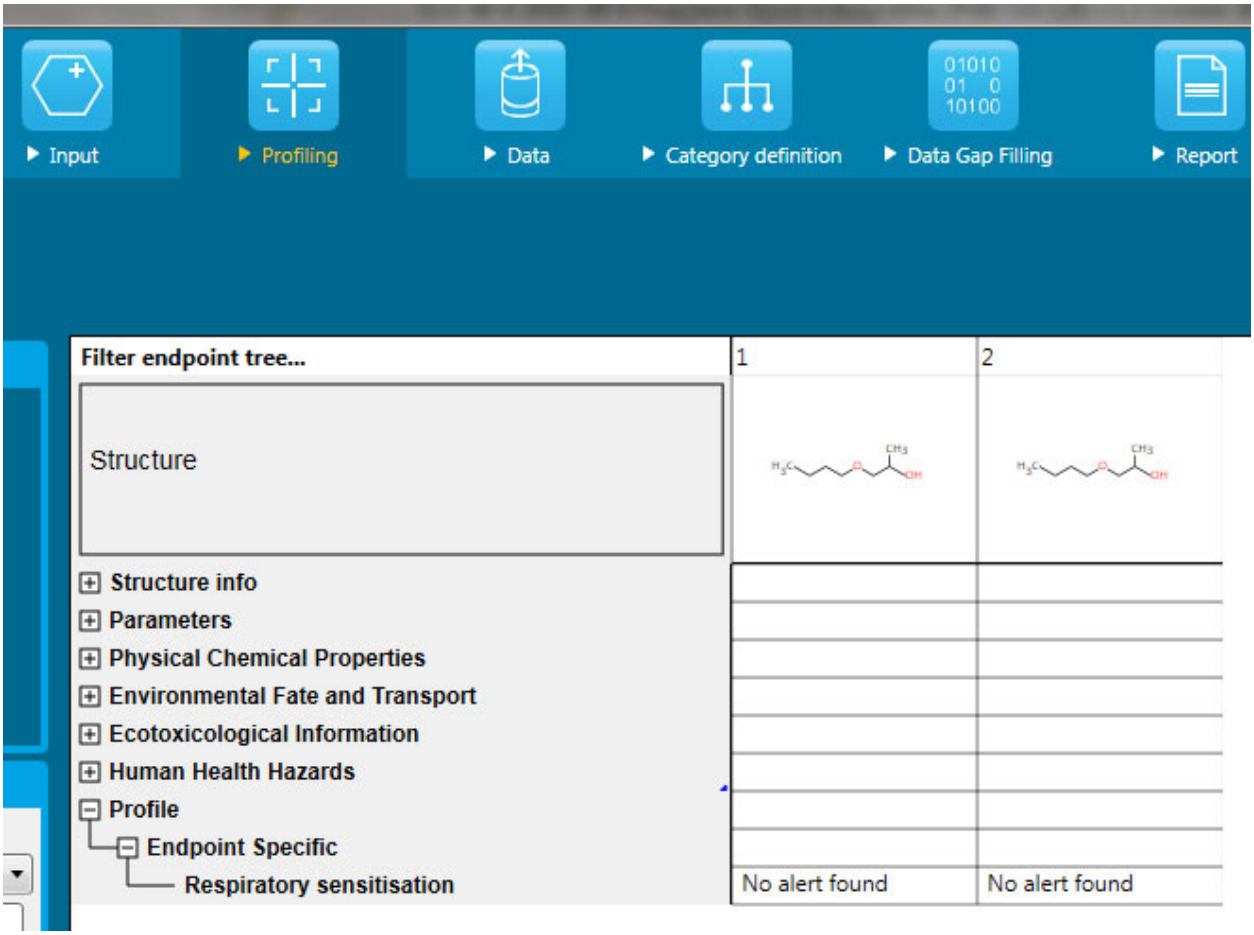
1-Butoxy-2-propanol
5131-66-8 | DTXSID8027589
Searched by CAS-RN.

ToxCast: Models
ToxCast Model Predictions

Download ToxCast Model Predictions

Model	Receptor	Agonist	Antagonist	Binding
ToxCast Pathway Model (AUC)	Androgen	-	-	-
ToxCast Pathway Model (AUC)	Estrogen	-	-	-
COMPARA (Consensus)	Androgen	Inactive	Inactive	Inactive
CERAPP Potency Level (From Literature)	Estrogen	Inactive (Inactive)	Inactive (Inactive)	Inactive (Inactive)
CERAPP Potency Level (Consensus)	Estrogen	Inactive (Inactive)	Inactive (Inactive)	Inactive (Inactive)

APPENDIX E: OECD Toolbox Respiratory Sensitization Results for 1-Butoxypropan-2-ol (CAS #5131-66-8)



APPENDIX F: ECOSAR Modeling Results for 1-Butoxypropan-2-ol (CAS #5131-66-8)

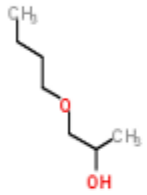
Created on Jun 23, 2021 11:24:14 AM

Organic Module Report

Results of Organic Module Evaluation

CAS	Name	SMILES
5131668	2-Propanol, 1-butoxy-	O(CC(O)C)CCCC

Structure



Details	
Mol Wt	132.2
Selected LogKow	1.2
Selected Water Solubility (mg/L)	46894.73
Selected Melting Point (°C)	-85
Estimated LogKow	0.98
Estimated Water Solubility (mg/L)	46894.73
Measured LogKow	
Measured Water Solubility (mg/L)	
Measured Melting Point (°C)	

Class Results:	

Neutral Organics

Organism	Duration	End Point	Concentration (mg/L)	Max Log Kow	Flags
Fish	96h	LC50	567.97	5	
Daphnid	48h	LC50	299.53	5	
Green Algae	96h	EC50	164.4	6.4	
Fish		ChV	50.88	8	
Daphnid		ChV	23.78	8	
Green Algae		ChV	36.52	8	
Fish (SW)	96h	LC50	711.62	5	
Mysid	96h	LC50	909.3	5	

1 / 2

Class Results:	

Organism	Duration	End Point	Concentration (mg/L)	Max Log Kow	Flags
Fish (SW)		ChV	47.39	8	
Mysid (SW)		ChV	99.62	8	
Earthworm	14d	LC50	278.23	6	

APPENDIX G: EPI Suite™ Modeling Results for 1-Butoxypropan-2-ol (CAS #5131-66-8)

(Estimated values included in the GreenScreen® are highlighted and bolded)

CAS Number: 5131-66-8
SMILES : O(CC(O)C)CCCC
CHEM : 2-Propanol, 1-butoxy-
MOL FOR: C7 H16 O2
MOL WT : 132.20
---------- EPI SUMMARY (v4.11) ----------
Physical Property Inputs:
Log Kow (octanol-water): 1.20
Boiling Point (deg C) : 171.50
Melting Point (deg C) : -85.00
Vapor Pressure (mm Hg) : 1.0426
Water Solubility (mg/L): 55000
Henry LC (atm-m3/mole) : ------

Log Octanol-Water Partition Coef (SRC):
Log Kow (KOWWIN v1.69 estimate) = 0.98

Boiling Pt, Melting Pt, Vapor Pressure Estimations (MPBPVP v1.43):
Boiling Pt (deg C): 182.67 (Adapted Stein & Brown method)
Melting Pt (deg C): -21.73 (Mean or Weighted MP)
VP(mm Hg,25 deg C): 0.397 (Mean VP of Antoine & Grain methods)
VP (Pa, 25 deg C) : 53 (Mean VP of Antoine & Grain methods)
BP (exp database): 171.5 deg C

Water Solubility Estimate from Log Kow (WSKOW v1.42):
Water Solubility at 25 deg C (mg/L): 4.689e+004
log Kow used: 1.20 (user entered)
melt pt used: -85.00 deg C

Water Sol Estimate from Fragments:
Wat Sol (v1.01 est) = 84559 mg/L

ECOSAR Class Program (ECOSAR v1.11):
Class(es) found:
Neutral Organics

Henrys Law Constant (25 deg C) [HENRYWIN v3.20]:
Bond Method : 1.30E-007 atm-m3/mole (1.32E-002 Pa-m3/mole)
Group Method: 4.88E-008 atm-m3/mole (4.95E-003 Pa-m3/mole)
For Henry LC Comparison Purposes:
User-Entered Henry LC: not entered
Henrys LC [via VP/WSol estimate using User-Entered or Estimated values]:
HLC: 3.297E-006 atm-m3/mole (3.341E-001 Pa-m3/mole)
VP: 1.04 mm Hg (source: User-Entered)
WS: 5.5E+004 mg/L (source: User-Entered)

Log Octanol-Air Partition Coefficient (25 deg C) [KOAWIN v1.10]:
Log Kow used: 1.20 (user entered)
Log Kaw used: -5.275 (HenryWin est)
Log Koa (KOAWIN v1.10 estimate): 6.475
Log Koa (experimental database): None

Probability of Rapid Biodegradation (BIOWIN v4.10):
Biowin1 (Linear Model) : 0.6044
Biowin2 (Non-Linear Model) : 0.6600
Expert Survey Biodegradation Results:
Biowin3 (Ultimate Survey Model): 3.3567 (days-weeks)
Biowin4 (Primary Survey Model) : 4.0458 (days)
MITI Biodegradation Probability:
Biowin5 (MITI Linear Model) : 0.5883
Biowin6 (MITI Non-Linear Model): 0.7307
Anaerobic Biodegradation Probability:
Biowin7 (Anaerobic Linear Model): 0.1728
Ready Biodegradability Prediction: YES

Hydrocarbon Biodegradation (BioHCwin v1.01):
Structure incompatible with current estimation method!

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:
Vapor pressure (liquid/subcooled): 139 Pa (1.04 mm Hg)
Log Koa (Koawin est): 6.475
Kp (particle/gas partition coef. (m3/ug)):
Mackay model : 2.16E-008
Octanol/air (Koa) model: 7.33E-007
Fraction sorbed to airborne particulates (phi):
Junge-Pankow model : 7.81E-007
Mackay model : 1.73E-006
Octanol/air (Koa) model: 5.86E-005

Atmospheric Oxidation (25 deg C) [AopWin v1.92]:
Hydroxyl Radicals Reaction:
OVERALL OH Rate Constant = 28.0116 E-12 cm3/molecule-sec
Half-Life = 0.382 Days (12-hr day; 1.5E6 OH/cm3)
Half-Life = 4.582 Hrs
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi):
1.26E-006 (Junge-Pankow, Mackay avg)
5.86E-005 (Koa method)
Note: the sorbed fraction may be resistant to atmospheric oxidation

Soil Adsorption Coefficient (KOCWIN v2.00):
Koc : 4.328 L/kg (MCI method)
Log Koc: 0.636 (MCI method)

Koc : 12.21 L/kg (Kow method)
Log Koc: 1.087 (Kow method)

Aqueous Base/Acid-Catalyzed Hydrolysis (25 deg C) [HYDROWIN v2.00]:
Rate constants can NOT be estimated for this structure!

Bioaccumulation Estimates (BCFBAF v3.01):
Log BCF from regression-based method = 0.459 (BCF = 2.876 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -1.1622 days (HL = 0.06883 days)
Log BCF Arnot-Gobas method (upper trophic) = 0.319 (BCF = 2.086)
Log BAF Arnot-Gobas method (upper trophic) = 0.319 (BAF = 2.086)
log Kow used: 1.20 (user entered)

Volatilization from Water:
Henry LC: 3.3E-006 atm-m3/mole (calculated from VP/WS)
Half-Life from Model River: 205.3 hours (8.555 days)
Half-Life from Model Lake : 2336 hours (97.35 days)

Removal In Wastewater Treatment:
Total removal: 2.09 percent
Total biodegradation: 0.09 percent
Total sludge adsorption: 1.81 percent
Total to Air: 0.19 percent
(using 10000 hr Bio P,A,S)

Level III Fugacity Model: (MCI Method)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	**1.34**	**6.83**	**1000**
Water	**40.6**	**208**	**1000**
Soil	**58**	**416**	**1000**
Sediment	**0.0769**	**1.87e+003**	**0**

Persistence Time: 237 hr

Level III Fugacity Model: (MCI Method with Water percents)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	1.34	6.83	1000
Water	40.6	208	1000
water	(40.6)		
biota	(3.22e-005)		
suspended sediment	(0.000263)		
Soil	58	416	1000
Sediment	0.0769	1.87e+003	0

Persistence Time: 237 hr

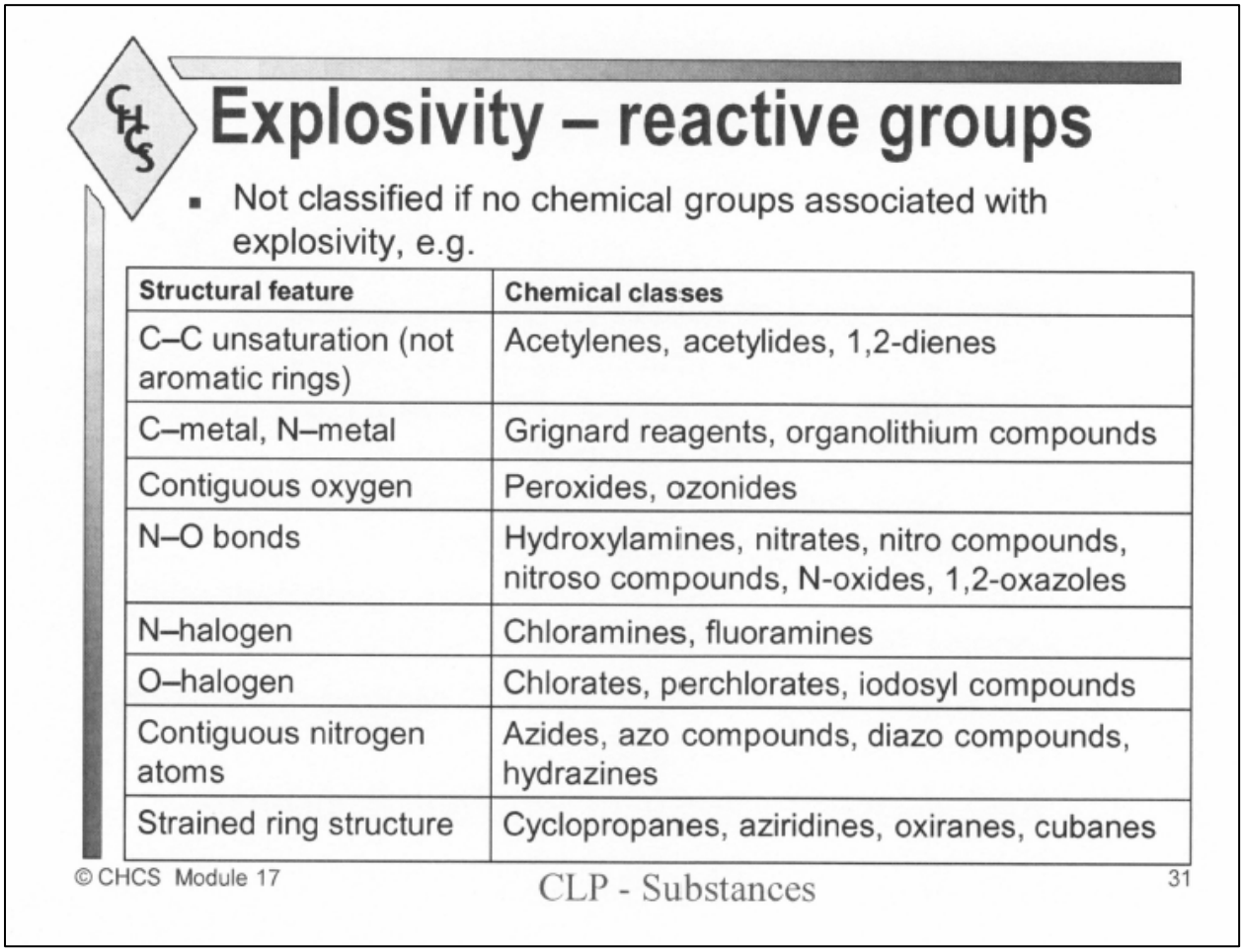
Level III Fugacity Model: (EQC Default)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)

Air 1.31 6.83 1000
Water 39.3 208 1000
water (39.3)
biota (3.12e-005)
suspended sediment (0.000383)
Soil 59.3 416 1000
Sediment 0.0777 1.87e+003 0
Persistence Time: 241 hr

APPENDIX H: Known Structural Alerts for Reactivity

Explosivity – Abbreviated List



Explosivity – reactive groups

- Not classified if no chemical groups associated with explosivity, e.g.

Structural feature	Chemical classes
C–C unsaturation (not aromatic rings)	Acetylenes, acetylides, 1,2-dienes
C–metal, N–metal	Grignard reagents, organolithium compounds
Contiguous oxygen	Peroxides, ozonides
N–O bonds	Hydroxylamines, nitrates, nitro compounds, nitroso compounds, N-oxides, 1,2-oxazoles
N–halogen	Chloramines, fluoramines
O–halogen	Chlorates, perchlorates, iodosyl compounds
Contiguous nitrogen atoms	Azides, azo compounds, diazo compounds, hydrazines
Strained ring structure	Cyclopropanes, aziridines, oxiranes, cubanes

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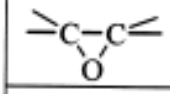
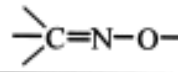
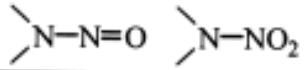
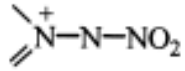
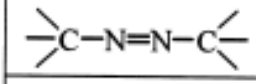
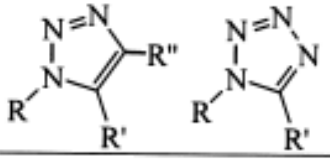
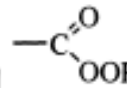
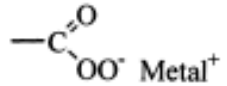
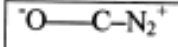
Explosivity – Full List

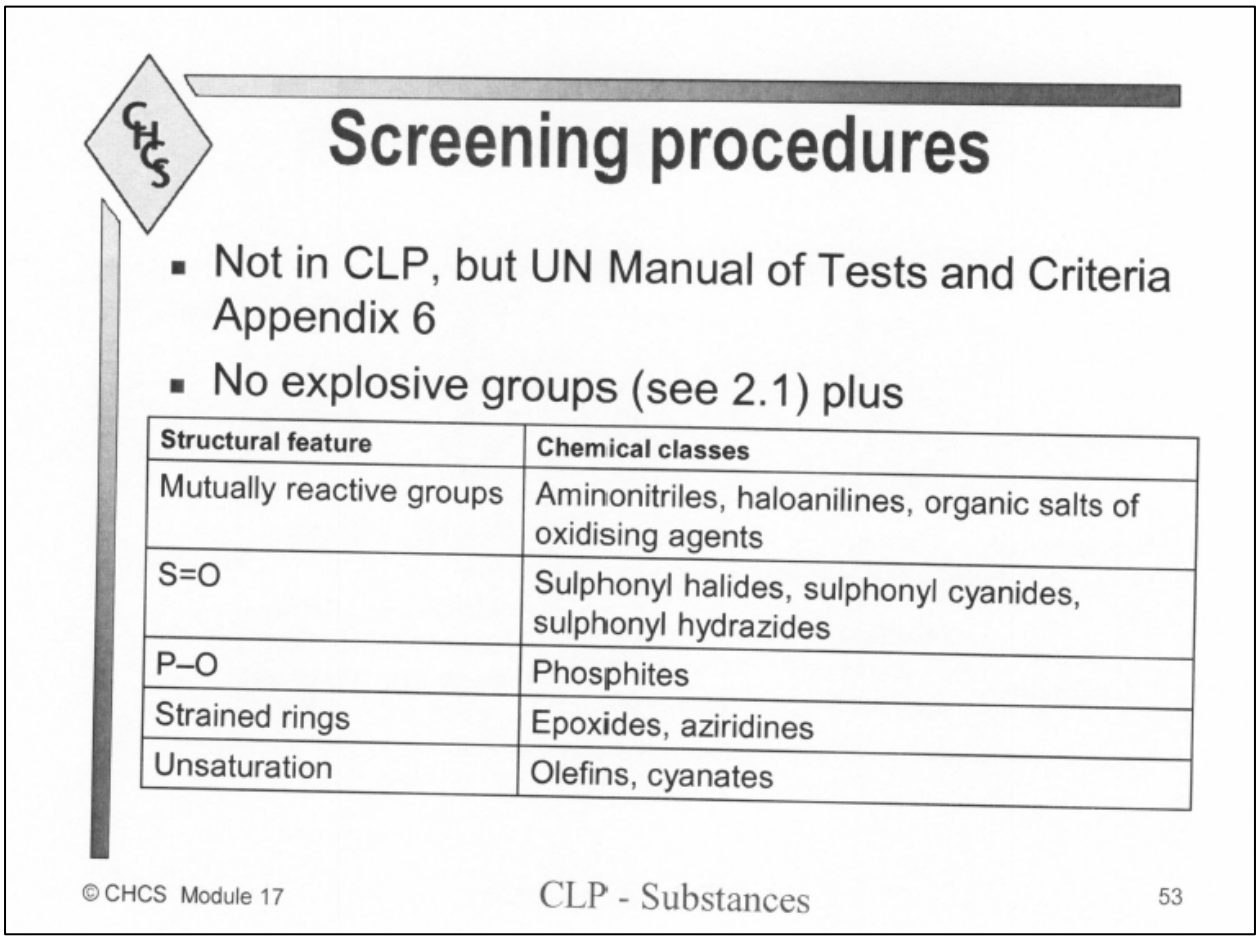
Table R.7.1-28 Chemical groups associated with explosive properties

Chemical group	Chemical Class
-C≡C- -C≡C-Metal -C≡C-Halogen	Acetylenic Compounds Metal Acetylides Haloacetylene Derivatives
	Diazo Compounds
-N=O -NO_2	Nitroso and Nitro Compounds,
R-O-N=O R-O-NO_2	Acyl or Alkyl Nitrites and Nitrates
	1,2-Epoxides
	Metal Fulminates or *aci*-Nitro Salts
	N-Metal Derivatives (especially heavy metals)
	N-Nitroso and N-Nitro Compounds
	N-Azolium Nitroimidates
	Azo Compounds
Ar-N=N-O-Ar	Arene Diazoates
$(ArN=N)_2O$, $(ArN=N)_2S$	Bis-Arenediazo Oxides and Sulfides
RN=N-NR'R''	Triazines
	High-nitrogen Compounds: e.g. Triazoles, Tetrazoles

Chemical group	Chemical Class
[1] ROOR', [2] 	Peroxy Compounds: [1] Alkyl hydroperoxides (R'=H), Peroxides (R'=organic); [2] Peroxo acids (R'=H), Peroxyesters (R'=organic)
[1] ROOMetal, [2] 	Metal peroxides, Peroxoacids salts
$-N_3$	Azides e.g. PbN_6, CH_3N_3
	Arenediazonium oxides i.e. inner diazonium salts in which the counter ion is an oxide
Ar-N=N-S- Ar-N=N-S-Ar	Diazonium sulfides and derivatives, Arenediazo Aryl Sulfides
XO_n	Halogen Oxide: e.g. percholrates, bromates, etc
NX_3 e.g. $NC1_3$, $RNC1_2$	N-Halogen Compounds

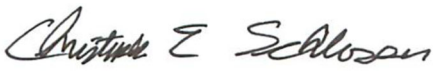
Adapted from Bretherick (Bretherick's Handbook of Reactive Chemical Hazards 6th Ed., 1999, Butterworths, London)

Self-Reactive Substances



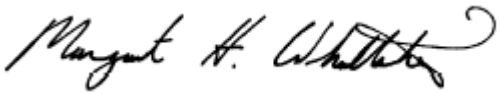
Licensed GreenScreen® Profilers

1-Butoxypropan-2-ol GreenScreen™ Evaluation Prepared By:



Christopher E. Schlosser M.F.S.
Associate Toxicologist
ToxServices LLC

1-Butoxypropan-2-ol GreenScreen™ Evaluation QC'd By:



Margaret H. Whittaker, Ph.D., M.P.H., CBiol., F.R.S.B., E.R.T., D.A.B.T.
Managing Director and Chief Toxicologist
ToxServices LLC

1-Butoxypropan-2-ol GreenScreen® Evaluation Updated by:

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1-Butoxypropan-2-ol GreenScreen® Update QC'd by:

Bingxuan Wang, Ph.D., D.A.B.T.
Senior Toxicologist
ToxServices LLC

1-Butoxypropan-2-ol GreenScreen® Evaluation Updated by:

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1-Butoxypropan-2-ol GreenScreen® Update QC'd by:

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