GreenScreen™ Assessment for
Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) (CAS# 13674-87-8)

Method Version: GreenScreen™ Version 1.2[1]

GreenScreen (GS) Assessment Type[2]: CERTIFIED

Introduction[3,4,5]

This GreenScreen assessment, for all hazard endpoints (except reactivity), is based solely on the information reported in the corresponding chemical hazard profile in "An Alternatives Assessment for Flame Retardants Used in Flexible Polyurethane Foam[3].

Additional information on hazard endpoints (other than reactivity) beyond what was reported in the draft June 2014 report was not sought. It was necessary to supplement the hazard classification for reactivity as it is not included in the DfE approach but is needed in order to apply the GreenScreen Benchmarks.

Differences in hazard classification levels reported in the DfE profiles and in this GreenScreen report may be due to differences between criteria as defined in the DfE "Alternatives Assessment Criteria for Hazard Evaluation"[4] and the GreenScreen for Safer Chemicals v1.2 methods[5]. Any differences in interpretation are explained and justified in this GreenScreen report.

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Licensed Profiler or Certified Practitioner (specify): N/A	Licensed Profiler or Certified Practitioner (specify): N/A

Confirm application of the *Disclosure and Assessment Rules and Best Practice*[6]: (List any deviations)
Disclosure thresholds applied by DfE are unclear in the DfE report.

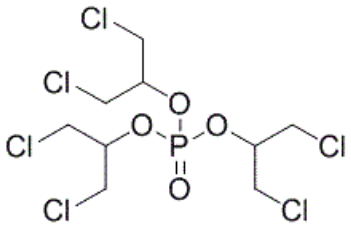
Chemical Name (CAS #):
Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) (CAS# 13674-87-8)

[1] Use GreenScreen™ Assessment Procedure (Guidance) V1.2
[2] Available at: http://www.greenscreenchemicals.org/about/greenscreen-terms-of-use
[3] Available at: http://www.epa.gov/dfe/pubs/projects/flameret/ffr-update-complete.pdf, accessed 11/2014.
[4] Available at: http://www.epa.gov/dfe/alternatives_assessment_criteria_for_hazard_eval.pdf, accessed 10/2013.
[5] Details available at: http://www.cleanproduction.org/Greenscreen.v1-2.php, accessed 10/2013.
[6] See GreenScreen Guidance V1.2 Section 8

Also Called:
2-Propanol, 1,3-dichloro-, phosphate (3:1); Tris(1,3-dichloro-2-propyl) phosphate; Tris(1-chloromethyl-2-chloroethyl) phosphate; Tris[2-chloro-1- (chloromethyl)ethyl] phosphate; tris (1,3-dichloroisopropyl) phosphate; 1,3-Dichloro-2-propanol phosphate (3:1); Phosphoric acid, tris(1,3-dichloro-2-propyl)ester; TDCP; TDCPP; Antiblaze 195; Antiblaze TDCP; Amgard TDCP; CRP; Fyrol FR-2; Tolgard TDCP; Tris

Suitable analogs or moieties of chemicals used in this assessment (CAS #'s):
No analog

Chemical Structure(s):
*Note: Include chemical structure(s) of all suitable analogs (and /or moieties) used in the assessment.



Notes related to production specific attributes[7]:

For Inorganic Chemicals and relevant particulate organics (*if not relevant, list NA*)
Define Properties:

1. Particle size (e.g., silica of respirable size): NA
2. Structure (e.g., amorphous vs. crystalline): NA
3. Mobility (e.g., water solubility, volatility): NA
4. Bioavailability: TDCPP is readily absorbed (100% assumed) by the oral route of exposure. Absorption through human skin membranes in vitro was calculated to be 6.0 - 15.4% of the applied dose. No accumulation in the body is expected due to rapid elimination of the compound.

Identify Applications/Functional Uses: (e.g., Cleaning product, TV casing)

1. Flame Retardant

[7] Note any composition or hazard attributes of the chemical product relevant to how it is manufactured. For example, certain synthetic pathways or processes result in typical contaminants, by-products or transformation products. Explain any differences between the manufactured chemical product and the GreenScreen assessment of the generic chemical by CAS #.

GreenScreen Benchmark™ Score and Hazard Summary Table:[8,9,10,11]

Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) was assigned a **GS Benchmark Score of 1** based on high carcinogenicity (Group I human toxicity endpoint). In a worst case scenario Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) would continue to be a benchmark 1 if any of the data gap were filled with data indicating a high hazard score.

Green Screen Hazard Ratings: Tris (1,3-dichloro-2-propyl) phosphate																	
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
						single	repeated*	single	repeated*										
H	M	M	*M*	M	L	NA	M	NA	L	*L*	DG	M	M	H	H	*vH*	L	*L*	*L*

Note: Hazard levels (Very High (vH), High (H), Moderate (M), Low (L), Very Low (vL)) in *italics* reflect estimated values, authoritative B lists, screening lists, weak analogues, and lower confidence. Hazard levels in **BOLD** font are used with good quality data, authoritative A lists, or strong analogues. 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. NA reflects that there was not data for this endpoint in the DfE assessment; however, it is not considered a data gap if the DfE report assesses repeated dose data for the same endpoint.

Environmental Transformation Products and Ratings[12]:

Identify feasible and relevant environmental transformation products (i.e., dissociation products, transformation products, valence states) and/or moieties of concern[13]

Functional Use	Life Cycle Stage	Transformation Pathway	Environmental Transformation Products	CAS #	Feasible and Relevant?	GreenScreen List Translator or Benchmark Scores
			None Available[14]			

[8] See Appendix A for a glossary of hazard endpoint acronyms
[9] See Appendix B for alternative GreenScreen Hazard Summary Table (Classification presented by exposure route)
[10] For inorganic chemicals only, see GreenScreen Guidance V1.2 Section 14.4. (Exceptions for Persistence)
[11] 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 V1.2 Section 9.3.
[12] See GreenScreen Guidance V1.2 Section 13
[13] A moiety is a discrete chemical entity that is a constituent part or component of a substance. A moiety of concern is often the parent substance itself for organic compounds. For inorganic compounds, the moiety of concern is typically a dissociated component of the substance or a transformation product.
[14] Only metabolites and thermal decomposition products were listed in the DfE report.

Introduction

This is a discrete organic chemical with a MW below 1,000. EPI v4.11 was used to estimate physical/chemical and environmental fate values due to an absence of experimental data. Measured values from experimental studies were incorporated into the estimations. Commercial formulations of this substance may contain minor amounts of structural isomers such as tris (2,3-dichloro-1-propyl) phosphate (CASRN 78-43-3) (WHO, 1998; NAS, 2000).

Hazard Classification Summary Section:

Group I Human Health Effects (Group I Human)

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

Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of HIGH for carcinogenicity based on a high score within the EPA's DfE Alternatives Assessment. The EPA's classification is based on sufficient animal test data and the inclusion of TDCPP on the California Proposition 65 list as a carcinogen. Using solely data, the high carcinogenic designation in the EPA's Alternatives Assessment is equivalent to a moderate designation within the GreenScreen. However, the inclusion of the chemical within California's Proposition 65, which is considered an authoritative "A" list for a high classification within GreenScreen, results in a high GreenScreen hazard score. The score was based on the inclusion of the chemical within an authoritative "A" list and is therefore bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
HIGH: Based on sufficient evidence of carcinogenicity in a two-year combined chronic toxicity and carcinogenicity assay in rats. This substance is also included as a substance known to cause cancer on the Proposition 65 list of chemicals.

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

Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for mutagenicity based on a moderate score within the EPA's DfE Alternatives Assessment. The EPA's classification is based on a weight of evidence approach when evaluating mixed results in the data set. While some positive effects were observed in *in vitro* assays, all *in vivo* assays were negative. The moderate designation for mutagenicity in both GreenScreen and EPA's Alternatives Assessment is based on the same criteria. The score was based on weight of evidence when evaluating study data within EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
MODERATE: Based on a weight of evidence including positive results in *in vitro* gene mutation and chromosomal aberration tests. Negative results were obtained in *in vivo* chromosomal aberration and unscheduled DNA synthesis assays.

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

Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for reproductive toxicity based on a data provided within the EPA's DfE Alternatives Assessment. The EPA's classification is based on atrophy and decreased secretory product of the seminal vesicle in an

oral two-year combined chronic toxicity and carcinogenicity assay in rats. For reproductive toxicity, EPA's DFE uses numerical data quantifying the hazard associated with the 3 different hazard levels, whereas GreenScreen does not base the hazard score on a numerical rating system but bases classifications on listing under GHS, the EU, and NTP. Therefore the conversion of DfE's reproductive toxicity conclusion to comparable GreenScreen hazard scores is done on a case by case basis. The reproductive effects which serve as the basis for EPA's classification are reported from a 2-year combined chronic toxicity and carcinogenicity assay, and not from a study designed to test reproductive effects. It has been concluded herein that the quality of reproductive data is not sufficient to place the substance in a GHS Category 1. Therefore TDCPP has been scored as a GHS Category 2 for reproductive toxicity. . The available data is more adequately characterized as a GHS category 2 and a moderate hazard under the GreenScreen. The score was based study data included within the EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was summarized as follows: HIGH: Based on a LOAEL of 5 mg/kg-day (NOAEL not established) for atrophy and decreased secretory product of the seminal vesicle in an oral two-year combined chronic toxicity and carcinogenicity assay in rats. Effects were also seen in the testes (eosinophilic material in lumen, periarteritis nodosa) at 20 mg/kg-day and the epididymis (oligospermia and degenerated seminal product) at 80 mg/kg-day.

Developmental Toxicity incl. Developmental Neurotoxicity (D) Score (H, M or L): *M*
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for developmental toxicity based on a data provided within the EPA's DfE Alternatives Assessment. The EPA's classification is based on increased resorptions and fetal mortality that occurred in conjunction with maternal toxicity and lethality in two prenatal developmental toxicity studies in rats. For developmental toxicity EPA's DfE uses numerical data quantifying the hazard associated with the 3 different hazard levels, whereas GreenScreen does not base the hazard score on a numerical rating system but bases classifications on listing under GHS, the EU, and NTP. Therefore the conversion of DfE's developmental toxicity conclusions to comparable GreenScreen hazard scores is done on a case by case basis. The developmental effects which serve as the basis for EPA's classification occurred only at maternally lethal doses. In addition the test substance: purity not reported. It has been concluded herein that the quality of developmental data is not sufficient to place the substance in a GHS Category 1. Therefore TDCPP has been scored as a GHS Category 2 for developmental toxicity.. The reported hazard effects, however, occurred only at levels associated with maternal toxicity and raises the level of uncertainty in the final effects. The moderate score is therefore reported in italics within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows: MODERATE: Based on NOAELs of 100 and 200 mg/kg bw-day in two prenatal developmental toxicity studies in rats. A LOAEL of 400 mg/kg-day was established for increased resorptions and fetal mortality that occurred in conjunction with maternal toxicity and lethality. In addition, abnormal development (short tail, reduced body weight) was evident in a study examining developmental phenotypes in zebrafish embryos/larvae. This study adds weight of evidence for developmental toxicity of TDCPP. There were no data located for the developmental neurotoxicity endpoint.

Endocrine Activity (E) Score (H, M or L): M
The DfE Alternative Assessment does not assign a hazard score for endocrine activity but provides information relevant to this endpoint. Using EPA provided data tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for endocrine activity based on evidence of endocrine activity without clear evidence of related human health effects. The score was based upon study data included within the EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
TDCPP in house dust has been correlated with altered levels of hormones related to fertility and thyroid function in men. TDCPP inhibited the luciferase expression induced by dihydrotestosterone in a reporter-gene assay using cultured cells and induced delays in remethylation of the zygotic genome (mechanism that may be associated with enhanced developmental toxicity) in zebrafish. In addition, TDCPP disrupted steroidogenic pathways and metabolism of estrogen in human cell lines (H2925R and WVLN) and in zebrafish. A 2-year combined chronic toxicity and carcinogenicity assay in rats resulted in changes of the parathyroid, testes, and epididymis; it is unclear if these observed changes may be an indication of 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 1.2 Benchmark system (the asterisk indicates repeated exposure). For Systemic Toxicity and Neurotoxicity, Group II and II* are considered sub-endpoints. When classifying hazard for Systemic Toxicity/Organ Effects and Neurotoxicity endpoints, repeated exposure results are required and preferred. Lacking repeated exposure results in a data gap. Lacking single exposure data does not result in a data gap when repeated exposure data are present (shade out the cell in the hazard table and make a note). If data are available for both single and repeated exposures, then the more conservative value is used.*

Acute Mammalian Toxicity (AT) Group II Score (vH, H, M or L): L
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for acute mammalian toxicity based on a low score within the EPA's DfE Alternatives Assessment. Acute mammalian toxicity classification in both the EPA's DfE and GreenScreen is based on the same criteria. The acute mammalian toxicity score was based on test data and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: TDCPP is not acutely toxic via the oral, dermal and inhalation routes of exposure.

Systemic Toxicity/Organ Effects incl. Immunotoxicity (ST)

(ST-single) Group II Score (single dose: vH, H, M or L):
DfE evaluates Systemic Toxicity based on repeated exposures. Lack of data for Systemic Toxicity based on a single exposure does not constitute a data gap when data for repeated

exposures are available. This endpoint was not assessed by DfE in this evaluation and is assigned an 'NA'.

(ST-repeat) Group II* Score (repeated dose: H, M, L): M
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for repeated exposure systemic toxicity/organ effects based on data within the EPA's DfE report. This GreenScreen hazard score differs than the high score assigned by DfE. While the high designation for repeated exposure systemic toxicity/organ effects in both GreenScreen and EPA's Alternatives Assessment is based on the same criteria, the DfE's score for this endpoint is based on reproductive effects. Therefore, non-reproductive repeat effects presented within the DfE report were used to determine a GreenScreen hazard score. Specifically the most sensitive repeat dose effect reported within the DfE report is a LOAEL of 62.5 mg/kg-day based on increased relative liver weight in 90-day orally dosed females rats. The data for immunotoxicity included in the DfE report, which would correspond to a high GreenScreen score, was not used as it is based on subcutaneous injection and is not a standard route of exposure. The score was based on study data and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
HIGH: Based on a LOAEL of 5 mg/kg-day for atrophy and decreased secretory product of the seminal vesicle in an oral 2-year combined chronic toxicity and carcinogenicity assay in rats (NOAEL not established). Effects were also seen in the testes (eosinophilic material in lumen, periarteritis nodosa) at 20 mg/kg-day and the epididymis (oligospermia and degenerated seminal product) at 80 mg/kg-day.

In addition, TDCPP produced lymphoid depletion of the thymus and decreases in LPS (B-cell antigen) and Con A (T-cell antigen) in mice following subcutaneous injection for 4 days.

Neurotoxicity (N)
(N-single) Group II Score (single dose: vH, H, M or L):
DfE evaluates Neurotoxicity based on repeated exposures. Lack of data for Neurotoxicity based on a single exposure does not constitute a data gap when data for repeated exposures are available. This endpoint was not assessed by DfE in this evaluation and is assigned an 'NA'.

(N-repeat) Group II* Score (repeated dose: H, M, L): L
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for neurotoxicity based on a low score within the EPA's DfE Alternatives Assessment. The low designation in both GreenScreen and EPA's Alternatives Assessment is based on the same criteria. The score was based on study data within EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: Based on a weight of evidence. TDCPP did not produce neurotoxicity in acute, chronic or developmental studies in rats or in acute and subchronic studies in hens. TDCPP induced oxidative stress in undifferentiated PC12 cells, but did not impair cell growth or viability. However, there may be some potential for neurotoxicity based on a structural alert for organophosphates.

Skin Sensitization (SnS) Group II* Score (H, M or L): *L*
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for skin sensitization based on a low score within the EPA's DfE Alternatives Assessment. This conclusion was made based on study details reported in a robust summary for an unpublished and unidentified study, no additional information was provided. The low designation for skin sensitization in both GreenScreen and EPA's Alternatives Assessment is based on the same criteria. The score was based on information from an unidentified study using a test substance identified as Fyrol FR-2 within EPA's Alternatives Assessment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: Not a skin sensitizer in guinea pigs.

Respiratory Sensitization (SnR) Group II* Score (H, M or L): DG
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of data gap for respiratory sensitization. This conclusion was made based on no data located.

Skin Irritation/Corrosivity (IrS) Group II Score (vH, H, M or L): M
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE for Skin Irritation/Corrosivity based on a low score within the EPA's DfE Alternatives Assessment. The DfE's low dermal irritant score corresponds to a moderate score under GreenScreen Skin Irritation/Corrosivity. The score was based on study data within EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: TDCPP produced mild skin irritation in rabbits that cleared within 72 hours.

Eye Irritation/Corrosivity (IrE) Group II Score (vH, H, M or L): M
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of MODERATE based on a low score within the EPA's DfE Alternatives Assessment. The DfE score is based on slight irritation, slight conjunctival redness and slight discharge were noted in exposed rabbits; effects cleared by 24 hours. The DfE low hazard score for eye irritation corresponds to a moderate score under GreenScreen Eye Irritation/Corrosivity. The score was based on test data within EPA's Alternatives Assessment and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: TDCPP produced slight conjunctival effects in rabbits that cleared within 24 to 48 hours.

Ecotoxicity (Ecotox)

Acute Aquatic Toxicity (AA) Score (vH, H, M or L): H
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of HIGH for acute aquatic toxicity based on a high score within the EPA's DfE Alternatives Assessment. The high designation for acute aquatic toxicity in both GreenScreen and EPA's Alternatives Assessment is based on the

same criteria. The score was based on study data and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
HIGH: Based on a measured 96-hour LC_{50} of 1.1 mg/L in fish, a 48-hour LC_{50} of 3.8 mg/L in daphnia and a 72-hour ErC_{10} = 2.3 mg/L in green algae.

Chronic Aquatic Toxicity (CA) Score (vH, H, M or L): H
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of HIGH chronic aquatic toxicity based on a high score within the EPA's DfE Alternatives Assessment. The high designation for chronic aquatic toxicity in both GreenScreen and EPA's Alternatives Assessment is based on the same criteria. The score was based on study data and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
HIGH: Based on a measured 21-day NOEC of 0.5 mg/L (LOEC = 1.0 mg/L) in daphnid for reduced reproduction; the NOEC and LOEC for reduced growth was 1.0 mg/L and 2.0 mg/L, respectively. No experimental data were located for fish and green algae, but estimated data predicts HIGH concern for fish and Moderate concern for algae.

Environmental Fate (Fate)

Persistence (P) Score (vH, H, M, L, or vL): *vH*
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of VERY HIGH for persistence based on a high persistence score within the DfE report. The score was based on biodegradation test results indicating of a half-life greater than 60 days for TDCPP. A half-life greater than 60 days in water results in a Very High rating for persistence within GreenScreen. The hazard score is based on estimated half-life values within EPA's Alternatives Assessment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was summarized as follows:
HIGH: The persistence for TDCPP is based on experimental guideline biodegradation studies. There is evidence of TDCPP biodegradation resulting in a half-life greater than 60 days. A river die away test found 22% removal of TDCPP in 14 days and a non-guideline soil test reported 6% removal in 17 weeks with radiolabeled TDCPP. In ready biodegradability tests, OECD TG 301B, 301C and 301D, 0 to <1% biodegradation of TDCPP occurred after 28 days. Additionally, no evidence of TDCPP removal was found in 28 days in an OECD 302C guideline study. TDCPP will undergo hydrolysis under alkaline conditions, with half-lives of 15 days measured at pH 9 and 50°C. TDCPP is relatively stable to hydrolysis under neutral and acidic conditions, a half-life of >1 year was found under pH 4 and pH 7 conditions. TDCPP is not expected to be susceptible to direct photolysis by sunlight, since it does not absorb light at wavelengths >290 nm.

Bioaccumulation (B) Score (vH, H, M, L, or vL): L
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for bioaccumulation based on a low score within the EPA's DfE Alternatives Assessment. The low designation for

bioaccumulation in EPA's Alternatives Assessment is equivalent to a very low score in GreenScreen. It has been concluded based on the data available within the EPA report, however, that BCFs of 113 have been measured corresponding to a low GreenScreen hazard score. The score is based on study data and therefore is bolded within the GreenScreen assessment.

The summary provided within the EPA's Alternatives Assessment was as follows:
LOW: Based on multiple experimental BCF values below or near 100, the Low bioaccumulation designation criteria. Toxicokinetic studies indicate that TDCPP and metabolites are rapidly formed and eliminated. However, biomonitoring studies report detection of this compound in pine needles, human adipose tissue, human seminal plasma samples, fish and herring gull eggs.

Physical Hazards (Physical)

Reactivity (Rx) Score (vH, H, M or L): *L*
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for reactivity based upon its use as a flame retardant, information available in a material safety data sheet and a review of potential degradation products. In addition, potential degradation products are also non-reactive which indicates the parent compound is also likely to have low reactivity. DfE does not assess reactivity and this data is added to the information found in the DfE Alternatives Assessment. This conclusion was based on expert judgment and is reported in italics.

Flammability (F) Score (vH, H, M or L): *L*
Tris (1,3-dichloro-2-propyl) phosphate was assigned a score of LOW for flammability based its use as a flame retardant . This conclusion was based on expert judgment and is reported in italics.

Reactivity References:

ResNovae Technologies Material Safety Data Sheet (MSDS), tris (1,3-dichloro-2-propyl) phosphate, Product PyroFlex P-112, Version 3.0, published 05/05/2009, 6 pages, Section 2, Hazard Identification. '*HMIS Rating, Reactivity Hazard = 0*', Section 10: Stability and Reactivity Data '*Chemical Stability: This material is stable if stored under proper conditions*', accessed 11/16/2014.

AICL\Industrial Products Safety Data Sheet (MSDS), tris (1,3-dichloro-2-propyl) phosphate, Product Fyrol 38 7007F, Version 5, published 06/07/2014, 8 pages, Section 2, Hazard Identification. '*NFPA Rating, Reactivity = 0*', Section 10: Stability and Reactivity Data '*Stability: Stable under normal conditions*', accessed 11/16/2014.

Expert judgment:

Tris (1,3-dichloro-2-propyl) phosphate is a halogenated phosphate compound which degrades into phosphoric acid, 1,3-dichloro-2-propanol or related compounds. The US National Institute of Health's Hazardous Substances Database indicates that both phosphoric acid and 1,3-dichloro-2-propanol have '*Reactivity: 0. 0 = Includes materials that are normally stable, even under fire exposure conditions, and that do not react with water. Normal fire fighting procedures may be used.*' For these reasons, tris (1,3-dichloro-2-propyl) phosphate is expected to be non-reactive based upon professional judgment.

APPENDIX A: Hazard Benchmark Acronyms (alphabetical order)

(AA)	Acute Aquatic Toxicity
(AT)	Acute Mammalian Toxicity
(B)	Bioaccumulation
(C)	Carcinogenicity
(CA)	Chronic Aquatic Toxicity
(Cr)	Corrosion/ Irritation (Skin/ Eye)
(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
Optional Exposure Stratified GreenScreen Hazard Summary Table

Exposure Route	GreenScreen Hazard Ratings: [*Chemical Name*]																			
	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
							single	repeate	single	repeated[†]										
oral																				
dermal																				
inhalation																				

Appendix C
Modeling Results

Attach:

- **EPISuite Results for Chemical Name (CAS #)**
- **ECOSAR Results for Chemical Name (CAS #)**
- **Other**