Use Report for 4,4'-(1-Methylethylidene)bis[2, 6-dibromophenol] (TBBPA) (CAS RN 79-94-7)

January 2020

Contains no TSCA CBI

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Acknowledgment and Disclaimer

EPA acknowledges the analytical and draft preparation support of Abt Associates Inc. of Cambridge, Massachusetts, provided under Contract No. EP-W-16-009 in the preparation of this report.

This document provides publicly available information as of the date of this document on the manufacturing (including importing), processing, distribution in commerce, use, and disposal of TBBPA and is used to inform decisions regarding conditions of use. The document does not reflect information received directly from other sources such as manufacturers, processors, etc., which has further informed the conditions of use in the draft Scope Document. As such, the uses described in this document may differ from the conditions of use in the draft Scope Document.

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1. Introduction

In December 2019, EPA published a list of 20 chemical substances that have been designated high priority substances for risk evaluations (84 FR 71924), as required by TSCA § 6(b)(2)(B). 4,4'-(1-Methylethylidene)bis[2, 6-dibromophenol] (TBBPA) was one of these chemicals. In performing risk evaluations for existing chemicals, EPA is directed to "determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other non-risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant to the risk evaluation by the Administrator under the conditions of use." Condition of use is legally defined under TSCA § 3(4) as "*the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of*". This document provides publicly available information as of the date of this document on the manufacturing (including importing), processing, distribution in commerce, use, and disposal of TBBPA and is used to inform decisions regarding conditions of use. The document does not reflect information received directly from other sources such as manufacturers, processors, etc., which has further informed the conditions of use in the draft Scope Document. As such, the uses described in this document may differ from the conditions of use in the draft Scope Document.

EPA consulted a variety of sources to identify uses of TBBPA. This included EPA's review of published literature and online databases including the most recent data available from EPA's Chemical Data Reporting program (CDR) and Safety Data Sheets (SDSs). EPA also conducted online research by reviewing company websites of potential manufacturers, importers, distributors, retailers, or other users of TBBPA and queried government and commercial trade databases. Sources included information reported to EPA (including National Emissions Inventory and the Toxics Release Inventory when appropriate), literature searches, proprietary reports, trade publications, and reports developed for prior EPA and international sources. To identify formulated products containing TBBPA, EPA searched for (material) safety data sheets (M)SDS using internet searches, EPA Chemical and Product Categories (CPCat) data, the National Institute for Health's (NIH) Household Product Database, and other resources in which (M)SDS could be found. Each (M)SDS was then cross-checked with company websites to make sure that each product (M)SDS was current. EPA also makes use of communications with companies, industry groups, environmental organizations, and public comments to supplement the information when possible.

Table 1-1 includes basic information about TBBPA.

Table 1-1: Chemical Name, Synonyms, and CASRN for TBBPA

Chemical Name	4,4'-(1-Methylethylidene)bis[2, 6-dibromophenol]
CASRN	79-94-7
Synonyms	TBBPA; Tetrabromobisphenol A; 3,3',5,5'-Tetrabromobisphenol A; Bromdian; Tetrabromdian; 4,4'-(propane-2,2-diyl)bis(2,6-dibromophenol); 2,2-Bis(3,5-dibromo-4-hydroxyphenyl)propane; 4,4'-Isopropylidenebis(2,6-dibromophenol); Tetrabromodiphenylopropane; 2,2',6,6'-Tetrabromobisphenol A; Phenol, 4,4'-(1-methylethylidene)bis[2,6-dibromo
Trade Name(s)	Firemaster BP 4A; Fire Guard 2000; Great Lakes BA-59P; Saytex RB 100PC; FG 2000

Source: U.S. NLM 2019

2. Uses and Production Volume

TBBPA is one of the most widely used brominated flame retardants and is used as both an additive and reactive flame retardant (U.S. EPA 2015). Additive flame retardants are incorporated into polymers via physical mixing and are not chemically bound to the polymer. Reactive flame retardants are incorporated into polymers via chemical reactions at an early stage of manufacturing. Because manufacturers can incorporate additive flame retardants into the product up until the final stages of manufacturing, it is usually easier for them to use additive rather than reactive flame retardants. Reactive flame retardants have a greater effect on the chemical and physical properties of the polymer into which they are incorporated than do additive flame retardants (U.S. EPA 2015).

2.1 Domestic Manufacture and Import (CDR Data)

The Chemical Data Reporting (CDR) rule under TSCA requires manufacturers (including importers) to provide information to EPA every four years on the chemicals they manufacture or import into the United States. Table 2-1 presents the various conditions under which a facility subject to TSCA must report to CDR based on the reporting requirements for the 2016 data collection. Typically, a manufacturer is required to report any volume above 25,000 pounds, while small manufacturers[1] are only required to report any volume above 100,000 pounds. Data collected for each chemical include the company name, volume of each chemical manufactured/imported, the number of workers at each site, and information on whether the chemical is used in the industrial, commercial, and/or consumer sector. Exemptions apply to small manufacturers.

[1] The definition of a small manufacturer varies depending on the sector in which it operates.

Table 2-1. Conditions under Which a Company Must Report to CDR (shaded area applies to TBBPA)				
TSCA Action	Obligation to Report to CDR Information When Subject to TSCA Action			
	Subject to 25,000 lb reporting threshold	Subject to 2,500 lb reporting threshold	Not eligible for certain full or partial exemptions from reporting	Not eligible for small manufacturer exemption
Not subject to TSCA action	✓			
TSCA section 4 rules (proposed or promulgated)	✓		✓	✓
Enforceable Consent Agreements (ECAs)	✓		✓	
TSCA section 5(a)(2) SNURs (proposed or promulgated)		✓	✓	
TSCA section 5(b)(4) rules (proposed or promulgated)		✓	✓	✓
TSCA section 5(e) orders		✓	✓	✓
TSCA section 5(f) orders		✓	✓	
TSCA section 5 civil actions		✓	✓	✓
TSCA section 6 rules (proposed or promulgated)		✓	✓	✓
TSCA section 7 civil actions		✓	✓	✓
Note: The reporting thresholds provided in this table apply to the 2016 reporting cycle and are determined based on the chemical substance's status as of June 1, 2016.				

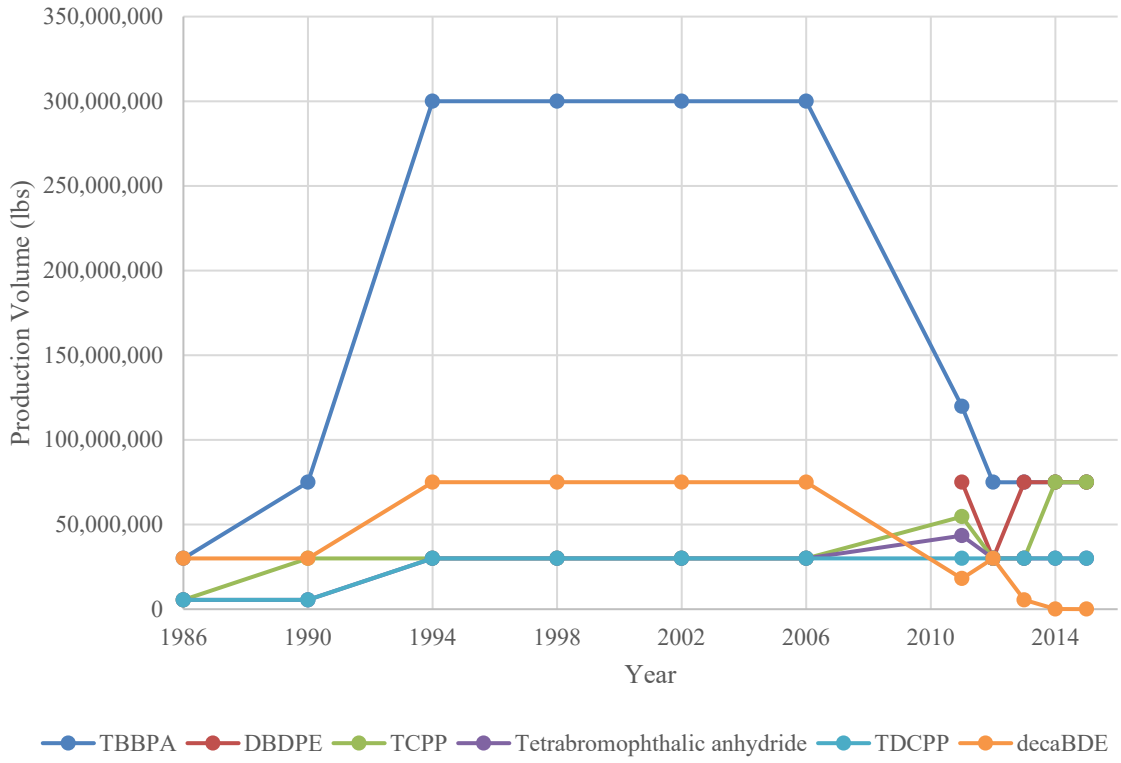
2.1.1 National Production Volume Trends

TBBPA is a flame retardant manufactured in the United States. TBBPA is produced by the bromination of bisphenol-A in the presence of a solvent. This reaction may be conducted in the presence of a hydrocarbon solvent only or with water, 50% hydrobromic acid or aqueous alkyl mono ethers. When methanol is used as the solvent, methyl bromide is formed as a byproduct. The production process is largely conducted in closed systems (U.S. NLM 2019). Table 2-2 presents the historic production volume of TBBPA from the CDR (previously known as the Inventory Update Rule, or IUR) from 1986 to 2015.

Table 2-2: 1986-2015 National Production Volume Data for TBBPA (CAS RN 79-94-7) (Non-Confidential Production Volume in Pounds)	
Year	**Production Volume (lbs)**
1986	>10 M – 50 M
1990	>50 M – 100 M
1994	>100 M – 500 M
1998	>100 M – 500 M
2002	>100 M – 500 M
2006	>100 M – 500 M
2011	119,837,559
2012	50 M – 100 M
2013	50 M – 100 M
2014	50 M – 100 M
2015	50 M – 100 M
Note: M = Million\	
Sources: U.S. EPA 2006, U.S. EPA 2013, U.S. EPA 2014, U.S. EPA 2017	

TBBPA has historically been the flame retardant with the largest production volume worldwide, especially since penta-BDE and octa-BDE have been phased out globally (U.S. NLM 2019). Figure 3 presents production volume trends reported under the Inventory Update Reporting Rule and CDR for six brominated or halogenated organophosphorus compounds with public production volume information available for 2012 and 2015. Figure 3 uses midpoint production volumes for the chemicals where only volume ranges were reported. Figure 3 reveals that TBBPA has historically had the highest production volume of the identified BFRs but has decreased since 2012.

Figure 3. Production Trends for Brominated Flame Retardants
[sources: U.S. EPA 2006, U.S. EPA 2013, U.S. EPA 2014, U.S. EPA 2017]



2.1.2 Manufacturers and Importers

According to the 2016 Chemical Data Reporting (CDR) database, seven companies manufactured or imported TBBPA at seven sites for reporting year 2015. Table 2-3 presents the company information and manufacture and import information where available. Table 2-3 does not represent all of the facilities potentially manufacturing or using TBBPA. CDR requires manufacturers (including importers) to report information on the TBBPA they produce domestically or import into the United States above 25,000 lbs. per site per year. Individual production volumes were withheld, but may be available in later releases of the 2016 CDR.

Table 2-3: 2016 CDR U.S. Manufacturers and Importers of TBBPA						
U.S. Parent Company	**Site**	**Site Address**	**Manufacture or Import**	**Manufactured Volume (lbs./yr.)**	**Imported Volume (lbs./yr.)**	**Past Production Volume (2014) (lbs./yr.)**
Albemarle Corporation	Albemarle Corp South Plant	2270 Highway 79 South, Magnolia, AR	Manufacture	Withheld	Withheld	Withheld
Chemtura Corporation			Manufacture	Withheld	Withheld	Withheld
Chemtura Corporation	Chemtura Corporation	199 Benson Road, Middlebury, CT	Import	Withheld	Withheld	Withheld
Hunstman Corporation	Huntsman Corporation – The Woodlands Corporate Site	10003 Woodloch Forest Dr., The Woodlands, TX	Import	Withheld	Withheld	Withheld
ICL North American Inc	ICL-IP America Inc.	622 Emerson Road, Suite 500, St. Louis, MO	CBI	Withheld	Withheld	Withheld
Lintech International LLC	Lintech International Inc.	7705 Ne Industrial Blvd, Macon, GA	Import	Withheld	Withheld	Withheld
Olin Corporation	Olin Corporation	1901 Carondelet Plz, Clayton, MO	Withheld	Withheld	Withheld	Withheld
Sabic US Holdings LP	Sabic Innovatice Plastics	1 Plastics Ave, Pittsfield, MA	CBI	Withheld	Withheld	Withheld
Source: U.S. EPA 2017						

2.1.3 Industrial and Consumer/Commercial Use Data

Table 2-4 presents the information provided by each company to CDR regarding the industrial and consumer/commercial use of the chemical. As shown in Table 2-4, there are seven sectors of industrial use reported by seven manufacturing sites. Of the seven manufacturing sites, two report that the chemical is used in the electrical equipment, appliance, and component manufacturing sector; and two in the all other chemical product and preparation manufacturing sector. Other sectors listed are computer and electronic product manufacturing, miscellaneous manufacturing, plastic material and resin manufacturing, plastics product manufacturing, and transportation equipment manufacturing – each with one site reporting use. Industrial uses reported include flame retardants, intermediates, industrial manufacturing, and processing aids. Consumer uses reported include electrical/electronic products, industrial manufacturing, and building/construction materials.

Table 2-4: Industrial and Consumer Use Data for TBBPA from the CDR							
Manufacturing Site	Type of Processing	Industrial Use Data			Consumer Use Data		
		Sector	Industrial Use	Percent of Production Volume	Consumer Use Product Category	Commercial or Consumer Use	Percent of Production Volume
Albemarle Corp South Plant	Processing—incorporation into article; Processing—incorporation into formulation, mixture, or reaction product	Electrical equipment, appliance, and component manufacturing	Flame retardants	40	Electrical and electronic products	Both	40
	Processing as a reactant	All other chemical product and preparation manufacturing	Intermediates	60	ND	ND	ND
Chemtura Corporation	Processing—incorporation into article; Processing—incorporation into formulation, mixture, or reaction product	Electrical equipment, appliance, and component manufacturing	Flame retardants	40	Electrical and electronic products	Consumer/ Commercial	40
	Processing as a reactant	All other chemical product and preparation manufacturing	Intermediates	60	ND	ND	ND
Huntsman Corporation – The Woodlands Corporate Site	Processing—incorporation into formulation, mixture, or reaction product	Transportation equipment manufacturing	Intermediates	100	Industrial Manufacturing	Commercial	100
	Processing—incorporation into formulation, mixture, or reaction product	Miscellaneous manufacturing	Industrial Manufacturing	5	ND	ND	ND
ICL-IP America Inc.	Processing—incorporation into formulation, mixture, or reaction product	Computer and electronic product manufacturing	Flame retardants	100	Electrical and electronic products	Consumer/ Commercial	100
Lintech International Inc.	Processing—incorporation into formulation, mixture, or reaction product	Plastic material and resin manufacturing	Processing aids, not otherwise listed	100	Building/construction materials not covered elsewhere	Commercial	100

Table 2-4: Industrial and Consumer Use Data for TBBPA from the CDR							
Manufacturing Site	Type of Processing	Industrial Use Data			Consumer Use Data		
		Sector	Industrial Use	Percent of Production Volume	Consumer Use Product Category	Commercial or Consumer Use	Percent of Production Volume
Olin Corporation	ND	ND	ND	ND	ND	ND	ND
Sabic Innovatice Plastics	Processing—incorporation into article	Plastics product manufacturing	Flame retardants	100	ND	ND	ND

Source:
U.S. EPA 2017

Note:
ND = No Data; the company did not provide the requested information.

2.2 Additional Import Data

For this analysis, Datamyne data over the years 2012 to 2019 (partial year, to May 11) were analyzed. Descartes Datamyne is a commercial searchable trade database that covers the import-export data and global commerce of more than 50 countries across five continents (approximately 76% of the world's import trade by value), and includes the cross-border commerce of the United States with over 230 trading partners. The trade data is gathered from U.S. Customs Automated Manifest System. For this analysis, EPA queried the database for bills of lading related to TBBPA. Due to the nature of Datamyne data, some shipments containing the chemical of concern may be excluded due to being categorized under other names that were not included in the search terms. There also may be typos in the data that prevent shipment records containing the chemical from being located. Datamyne does not include articles/products containing the chemical unless the chemical name is included in the description of the article/product.

Datamyne revealed data on shipments of TBBPA. Based on the descriptions provided on the bills of lading, Table 2-5 provides an estimate of the volume of TBBPA imported for the time period 2012 to May 11, 2019. Over this time period, total imports appear to be decreasing, and range in volume from approximately 882,000 kg (in 2012) to 376,000 kg (in 2014). Table 2-6 lists the importers of TBBPA as identified in Datamyne, from 2012 to 2018 (data for whole years only.)

Table 2-5. U.S. Volume of Imports of TBBPA (2012 to 2019)

Year	Total Import Volume (kg)[1]	Number of Unique Consignees
2012	881,984	44
2013	721,149	42
2014	376,035	19
2015	517,752	9
2016	410,554	18
2017	545,282	20
2018	384,374	16
2019 (to May 11)	103,305	6

Source: Descartes Datamyne 2019.

Note:

1. Shipments with weight units listed as "K" in Datamyne were assumed to be in kilograms. Weights provided in pounds were converted to kilograms to calculate the totals shown here.

Due to the nature of Datamyne data, some shipments containing the chemical of concern may be excluded due to being categorized under other names that were not included in the search terms. There also may be typos in the data that prevent shipment records containing the chemical from being located. Datamyne does not include articles/products containing the chemical unless the chemical name is included in the description of the article/product.

Table 2-6: U.S. Importers of TBBPA from Descartes Datamyne (2012 to 2018)								
Consignee Declared (Importer)	**Number of Shipments by Year**							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
3N International, Inc.					1			1
AOC LLC								0
Dsm Engineering Plastics Depam				1				1
ICL-Industrial Purchasing					1			1
ICL-IP America (IPA)	43	41	18	2	2	11	3	77
Lanxess Corp.						1	1	2
Lintech International, LLC	1	1	1	3	3			8
Shandong Brother International					1			1
TRI-ISO Tryline LLC					1	1	1	3
Vandemark Chemical Inc.						2	1	3
Not Declared				3	9	5	10	27
Total	**44**	**42**	**19**	**9**	**18**	**20**	**16**	

Source: Descartes Datamyne 2019
Note: Due to the nature of Datamyne data, some shipments containing the chemical of concern may be excluded due to being categorized under other names that were not included in the search terms. There also may be typos in the data that prevent shipment records containing the chemical from being located. Datamyne does not include articles/products containing the chemical unless the chemical name is included in the description of the article/product.

As shown in Table 2-6, the following companies imported TBBPA between 2012 and 2018. Contact with the companies is necessary to determine if they are currently importing or using TCEP.

- **3N International, Inc.** is a distributor that supplies flame retardants among other products. Located in Akron, OH, TPPBA is listed on their website as a product that they supply (3N 2019).

- **AOC Aliancys** is a global supplier of polyester and vinyl ester resins, gelcoats and specialty materials used for the composites industry. The company is located in Collierville, TN, and it produces fire-retardant brominated bisphenol-A epoxy vinyl esters, but no SDS were located for these products.

- **DSM Engineering Plastics** provides thermoplastics used in automotive, electrical & electronics, building & construction, medical, food packaging and consumer goods.

- **Lintech International, LLC** is a specialty chemical distributor of resins, monomers, additives, pigments, and performance materials. Based in Macon, GA, their markets include adhesives, coatings, composites, construction, inks, agriculture, plastics, and rubber.

- **Shandong Brother International** was first founded in 2008, is a subsidiary company of Shandong Brother Industry Group, located in Shandong, China. Shandong's products include engineering machinery like wheel loaders, forklifts, excavators, bulldozers, ATVs, go-carts, skid steer loaders, road rollers, solar panels and plastic films.

- **TRI-ISO Tryline LLC** was formed when Tri-iso Inc. and The TryLine Group LLC merged in 2015. The company is a distributor of specialty chemical products and raw materials, located in Cardiff by the Sea, CA.

- **Vandenark Chemical** manufactures phosgene derivatives used to produce agrochemcials, pharmaceuticals, adhesives, coatings, plastics, electronics, personal care items, flame

retardants and other products. The company is located in Lockport, NY. TBBPA was not listed among its products on its website.

2.3 Toxic Release Inventory Information

This section summarizes industry and facility information, manufacturing, processing, and otherwise use (MPOU) categorical data, and production-related waste trends for the chemical as reported to the Toxics Release Inventory (TRI).

TRI is used by EPA to learn about toxic chemical releases above certain reporting thresholds (generally 10,000 pounds), and pollution prevention activities from industrial and federal facilities. Annual reporting is required by facilities that are in specific industry sectors, employ 10 or more full-time equivalent employees, and manufacture, process, or otherwise use a TRI-listed chemical in quantities above a threshold level in a given year (U.S. EPA 2018). The approximately 600 chemicals listed by the TRI program cause cancer or other chronic human health effects, significant adverse acute human health effects, or significant adverse environmental effects. The TRI chemical list does not include all toxic chemicals used in the United States.

TRI data represent the reporting year 2017 Updated Dataset (released April 2019). Each table below contains detailed notes for each field. The purpose of including this information is to provide additional insight regarding the industries that produce, use, or handle TBBPA.

2.3.1 TRI Facilities

Table 2-7 shows that 53 facilities reported TBBPA to TRI in 2017. The facilities were listed in 16 NAICS codes. The NAICS codes reported most frequently were Plastics Material and Resin Manufacturing (10 facilities), Custom Compounding of Purchased Resins (7 facilities), and Hazardous Waste Treatment and Disposal (7 facilities). The full list of facilities (name and location) under each NAICS code can be found in Appendix B.

Table 2-7: Facilities Reporting Under TRI for TBBPA in 2017	
Industry Type (NAICS)	**Number of Facilities**
313320 Fabric Coating Mills	2
322220 Paper Bag and Coated and Treated Paper Manufacturing	1
325180 Other Basic Inorganic Chemical Manufacturing	2
325211 Plastics Material and Resin Manufacturing	10
325520 Adhesive Manufacturing	4
325991 Custom Compounding of Purchased Resins	7
325998 All Other Miscellaneous Chemical Product and Preparation Manufacturing	1
326130 Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	1
326199 All Other Plastics Product Manufacturing	5
333249 Other Industrial Machinery Manufacturing	1
334413 Semiconductor and Related Device Manufacturing	1
334419 Other Electronic Component Manufacturing	1
335931 Current-Carrying Wiring Device Manufacturing	1
336411 Aircraft Manufacturing	3
336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing	6
562211 Hazardous Waste Treatment and Disposal	7
TOTAL	**53**

Source:
2017 TRI Data (updated April, 2019).

Notes:
TRI facilities can report more than one NAICS codes on each chemical-specific form they submit. For this table, only the NAICS code designated as primary was used. For facility counts, facilities submitting either Form A or Form R are counted. For this table, facilities are counted by unique primary NAICS; if a multi-establishment facility submitted multiple forms with different primary NAICS, they are counted separately.

2.3.2 Manufacturing Facilities

Table 2-8 shows the number of facilities, by NAICS code, that reported manufacturing (including importing) of TBBPA under the 2017 TRI. The data in this table were compiled from Part II, Section 3 of the TRI Form R reports. Since any facility can select both "Produce" and "Import", the "Total" column may not reflect the sum of the "Produced" and "Imported" columns. According to the TRI data, TBBPA was produced by the same number of facilities as imported. Differences in results between TRI and CDR reporting, regarding manufacturers of TBBPA, may be due to differences in reporting requirements and thresholds.

Table 2-8: Reported Manufacturing Uses under TRI for TBBPA in 2017			
Industry Type	Manufacturing – Number of Uses		
	Produced	Imported	Total
325180 Other Basic Inorganic Chemical Manufacturing	2	1	2
334413 Semiconductor and Related Device Manufacturing	0	1	1
562211 Hazardous Waste Treatment and Disposal	1	1	1
TOTAL	**3**	**3**	**4**

Source:
2017 TRI Data (updated April, 2019).
Notes:
Data taken from Part II, Section 3 of the Form R.
TRI facilities can report more than one NAICS codes on each chemical-specific form they submit. For this table, only the NAICS code designated as primary is used. For facility counts, facilities that report 0 or greater pounds in sections 5, 6, or 8 for this chemical are counted. For this table, facilities are counted by unique primary NAICS; if a multi-establishment facility submits multiple forms with different primary NAICS, they will be counted separately. Note that zero can indicate 0.5 pounds or less, including zero.

Table 2-9 provides the subcategory for manufacturing of TBBPA at the facilities reporting to TRI. That is, the table shows the reported reason why the chemical is produced or imported. According to the TRI data, TBBPA was most often manufactured or imported for on-site use/processing or for sale/distribution.

Table 2-9: Reported Sub-Categories of Manufacturing Uses under TRI for TBBPA in 2017					
Facility Name	Sub-Categories of Manufacturing – Number of Uses				
	For On-site Use/ Processing	For Sale/ Distribution	As a Byproduct	As an Impurity	Total
325180 Other Basic Inorganic Chemical Manufacturing					**2**
ALBEMARLE CORP SOUTH PLANT	1	1	0	0	
GREAT LAKES CHEMICAL - CENTRAL		1	0	0	
334413 Semiconductor and Related Device Manufacturing					**1**
PARKER HANNIFIN CORP CHOMERICS DIV	1	0	0	0	
562211 Hazardous Waste Treatment and Disposal					**1**
TRADEBE TREATMENT & RECYCLING LLC	0	0	1	1	
TOTAL	2	2	1	1	4

Source:
2017 TRI Data (updated April, 2019).
Notes:
Data taken from the first column of Part II, Section 3 of the Form R.
TRI facilities can report more than one NAICS codes on each chemical-specific form they submit. For this table, only the NAICS code designated as primary is used. For facility counts, facilities that report 0 or greater pounds in sections 5, 6, or 8 for this chemical are counted. For this table, facilities are counted by unique primary NAICS; if a multi-establishment facility submits multiple forms with different primary NAICS, they will be counted separately. Note that zero can indicate 0.5 pounds or less, including zero.). The "Total" column may not be equal to the sum of the other columns, since any facility may check multiple sub-categories

2.3.3 Processing Facilities

Table 2-10 shows the number of facilities, by NAICS code, that reported each type of processing for TBBPA under the 2017 TRI. The chemical is most often reported to be used as a formulation component, in the Custom Compounding of Purchased Resins industry.

Table 2-10: Reported Categories of Processing under TRI for TBBPA in 2017						
Industry Type	Categories of Processing – Number of Uses					
	As a Reactant	As a Formulation Component	As an Article Component	Repacking	As an Impurity	Total
313320 Fabric Coating Mills	1	1	0	0	0	2
322220 Paper Bag and Coated and Treated Paper Manufacturing	0	1	0	0	0	1
325180 Other Basic Inorganic Chemical Manufacturing	1	1	0	1	0	1
325211 Plastics Material and Resin Manufacturing	6	4	0	0	1	10
325520 Adhesive Manufacturing	0	3	1	0	0	4
325991 Custom Compounding of Purchased Resins	0	7	0	0	0	7
325998 All Other Miscellaneous Chemical Product and Preparation Manufacturing	0	0	0	1	0	1
326130 Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	0	1	0	0	0	1
326199 All Other Plastics Product Manufacturing	0	2	3	0	0	5
333249 Other Industrial Machinery Manufacturing	0	0	1	0	0	1
334413 Semiconductor and Related Device Manufacturing	0	1	1	0	0	1
334419 Other Electronic Component Manufacturing	0	1	0	1	0	1
335931 Current-Carrying Wiring Device Manufacturing	1	0	0	0	0	1
336411 Aircraft Manufacturing	0	1	2	0	0	3
336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing	2	1	4	0	0	6
TOTAL	**11**	**24**	**12**	**3**	**1**	**45**

Source:
2017 TRI Data (updated April, 2019).
Notes:
Data taken from the second column of Part II, Section 3 of the Form R.
TRI facilities can report more than one NAICS codes on each chemical-specific form they submit. For this table, only the NAICS code designated as primary is used. For facility counts, facilities that report 0 or greater pounds in sections 5, 6, or 8 for this chemical are counted. For this table, facilities are counted by unique primary NAICS; if a multi-establishment facility submits multiple forms with different primary NAICS, they will be counted separately. Note that zero can indicate 0.5 pounds or less, including zero. The "Total" column may not be equal to the sum of the other columns, since any facility may check multiple sub-categories..

2.3.4 Other Uses

Table 2-11 shows the number of facilities, by NAICS code, that reported "otherwise using" TBBPA under the 2017 TRI, and the numbers reporting each of the categories of otherwise use. According to the TRI data, ancillary or other uses are the most often reported.

Table 2-11: Reported Categories of Other Uses under TRI for TBBPA in 2017				
Industry Type	Categories of Otherwise Use – Number of Uses			
	As a Chemical Processing Aid	As a Manufacturing Aid	Ancillary or Other Use	Total
334419 Other Electronic Component Manufacturing	1	0	0	1
336411 Aircraft Manufacturing	0	1	0	1
562211 Hazardous Waste Treatment and Disposal	0	0	7	7
TOTAL	**1**	**1**	**7**	**9**

Source:
2017 TRI Data (updated April, 2019).
Notes:
Data taken from the third column of Section II, Part 3 of the Form R.
TRI facilities can report more than one NAICS codes on each chemical-specific form they submit. For this table, only the NAICS code designated as primary is used. For facility counts, facilities that report 0 or greater pounds in sections 5, 6, or 8 for this chemical are counted. For this table, facilities are counted by unique primary NAICS; if a multi-establishment facility submits multiple forms with different primary NAICS, they will be counted separately. Note that zero can indicate 0.5 pounds or less, including zero. The "Total" column may not be equal to the sum of the other columns, since any facility may check multiple sub-categories.

2.3.5 Maximum Quantity of Chemicals on Site

For each facility reporting to TRI on TBBPA, Table 2-12 shows the maximum amount of the chemical on-site at any time during the 2017 calendar year, for each of the facilities reporting for TBBPA under the 2017 TRI. (Reporters respond by indicating the applicable weight range). According to TRI data, the highest volume stored is 1,000,000 to 9,999,999 lbs by the Albemarle Corp South Plant in Arkansas.

Table 2-12: Maximum Quantity of TBBPA on Site at Any Time During 2017 (range in lbs)					
Facility	**City**	**State**	**Latitude**	**Longitude**	**Weight Range in Pounds**
3D Plastics Inc	Newberg	OR	45.299403	-122.951801	10,000 to 99,999
3M Co - Springfield	Springfield	MO	37.21287	-93.2272	10,000 to 99,999
A Schulman CCNE	Worcester	MA	42.28792	-71.80207	1,000 to 9,999
Albemarle Corp South Plant	Magnolia	AR	33.1756	-93.2169	1,000,000 to 9,999,999
AOC LLC Tennessee Plant	Collierville	TN	35.041758	-89.625081	100,000 to 999,999
Ashland LLC	Commerce	CA	33.983333	-118.133333	10,000 to 99,999
Ashland Performance Materials Philadelphia Plant	Philadelphia	PA	39.90967	-75.130075	100,000 to 999,999
Axiom Materials	Santa Ana	CA	33.71356	-117.84358	1,000 to 9,999
Boeing Commercial Airplanes - Everett	Everett	WA	47.923302	-122.273197	100 to 999
Bostik Manufacturing Plant	Middleton	MA	42.569383	-71.029235	100 to 999
Chroma Corp	Mc Henry	IL	42.311151	-88.274037	1,000 to 9,999
Clean Harbors Deer Park LLC	La Porte	TX	29.73028	-95.08981	0 to 99
Clean Harbors Grassy Mountain LLC	Grantsville	UT	40.825001	-113.208334	100 to 999
Cooper Power Systems LLC	Olean	NY	42.0717	-78.39067	100 to 999
Cytec Aerospace Materials	Havre De Grace	MD	39.536864	-76.107247	10,000 to 99,999
Cytec Engineered Materials Inc	Winona	MN	44.05601	-91.64975	1,000 to 9,999
Cytec Solvay Composite Materials Anaheim	Anaheim	CA	33.86194	-117.86123	1,000 to 9,999
Cytec Solvay Composite Materials Orange	Orange	CA	33.79776	-117.85582	1,000 to 9,999
Dassault Falcon Jet Corp	Little Rock	AR	34.736629	-92.231876	100 to 999
EQ Detroit Inc	Detroit	MI	42.36591	-83.04774	100 to 999
General Dynamics Mission Systems Inc	Marion	VA	36.84435	-81.49345	1,000 to 9,999
Great Lakes Chemical - Central	El Dorado	AR	33.184744	-92.706867	100,000 to 999,999
Heath Tecna Inc	Bellingham	WA	48.7729	-122.44534	100 to 999
Hexcel Corp	West Valley City	UT	40.653604	-112.054074	100 to 999
Hexcel Corp	Kent	WA	47.424143	-122.229086	1,000 to 9,999
Huntsman Advanced Materials Americas Inc	Mc Intosh	AL	31.278056	-88.001667	10,000 to 99,999
Intellipak LTD	Newbury	OH	41.464	-81.28	10,000 to 99,999
Interplastic Corp	Pryor	OK	36.23651	-95.27664	100,000 to 999,999
Isola USA Corp	Chandler	AZ	33.3013	-111.89358	10,000 to 99,999
Lamart Corp	Clifton	NJ	40.889432	-74.160195	1,000 to 9,999

Table 2-12: Maximum Quantity of TBBPA on Site at Any Time During 2017 (range in lbs)					
Facility	**City**	**State**	**Latitude**	**Longitude**	**Weight Range in Pounds**
LMR Plastics	Greeneville	TN	36.18815	-82.79759	10,000 to 99,999
Miller Waste Mills (Dba RTP Co)	Winona	MN	44.050315	-91.62139	1,000 to 9,999
Mission Plastics North	Grandview	MO	38.88064	-94.543744	100 to 999
Mitsubishi Chemical Carbon Fiber & Composites Inc	Irvine	CA	33.69238	-117.84932	1,000 to 9,999
Nordam I&S Div	Tulsa	OK	36.2552	-95.91993	1,000 to 9,999
Nordam Repair Div	Tulsa	OK	36.17707	-95.798886	1,000 to 9,999
Park Aerospace Technologies Corp	Newton	KS	38.04721	-97.2816	1,000 to 9,999
Parker Hannifin Corp Chomerics Div	Hudson	NH	42.73075	-71.43103	100 to 999
Plastech Corp	Rush City	MN	45.67785	-92.96751	1,000 to 9,999
Precision Plastics Inc	Columbia City	IN	41.17129	-85.50981	100 to 999
Ravago Manufacturing Americas	Manchester	TN	35.43704	-86.0245	100,000 to 999,999
Sabic Innovative Plastics Mt Vernon LLC	Mount Vernon	IN	37.9072	-87.9271	100,000 to 999,999
Sabic Innovative Plastics US LLC	Selkirk	NY	42.575416	-73.853563	100 to 999
Sabic Innovative Plastics US LLC	Ottawa	IL	41.334533	-88.755775	100,000 to 999,999
Solepoxy Inc	Olean	NY	42.094861	-78.439994	1,000 to 9,999
Sumitomo Bakelite NA Inc	Manchester	CT	41.79705	-72.51852	1,000 to 9,999
Tencate Advanced Composites	Fairfield	CA	38.229248	-122.076919	100 to 999
The Gill Corp	El Monte	CA	34.08291	-118.06062	100 to 999
Tradebe Treatment & Recycling LLC	East Chicago	IN	41.633441	-87.461568	0 to 99
Trinity Specialty Compounding	West Unity	OH	41.58475	-84.43999	1,000 to 9,999
US Ecology Idaho Inc	Grand View	ID	43.0635	-116.26375	100 to 999
US Ecology Nevada Inc	Beatty	NV	36.767649	-116.69368	1,000 to 9,999
Wayne Disposal Inc	Belleville	MI	42.21917	-83.522691	1,000 to 9,999

Source:
2017 TRI Data (updated April, 2019).
Notes:
This table presents data from Part II, Section 4 of the Form R. Coordinates are taken from EPA's FRS system.
For facilities that submitted multiple Form Rs, each submission is shown separately.

2.3.6 TRI Waste Managed

Table 2-13 shows that 133,356 pounds of TBBPA waste was managed in each of four waste management categories at the 53 facilities. According to TRI data, the majority of TBBPA that is managed as waste (74,290 pounds) is released.

Table 2-13: Summary of TBBPA TRI Production-Related Waste Managed in 2017 (lbs)

Facility Name	Recycling	Energy Recovery	Treatment	Releases [a, b]	Production Related Waste
313320 Fabric Coating Mills					
CYTEC SOLVAY COMPOSITE MATERIALS ORANGE	.	.	.	173	173
AXIOM MATERIALS	.	.	.	311	311
322220 Paper Bag and Coated and Treated Paper Manufacturing					
LAMART CORP	.	29	.	123	152
325180 Other Basic Inorganic Chemical Manufacturing					
GREAT LAKES CHEMICAL - CENT	.	.	.	0	0
325180 Other Basic Inorganic Chemical Manufacturing					
ALBEMARLE CORP SOUTH PLNT	.	.	.	56,063	56,063
325211 Plastics Material and Resin Manufacturing					
SABIC INNOVATIVE PLASTICS US	.	.	.	29	29
ASHLAND PERFORMANCE MATERIALS PHILA PLANT	.	2	97	53	152
HUNTSMAN ADVANCED MATERIALS AMERICAS INC	.	.	75	97	172
AOC LLC TENNESSEE PLANT	.	.	.	.	.
SABIC INNOVATIVE PLASTICS MT VERNON LLC	.	.	175	22	197
CYTEC ENGINEERED MATERIALS	.	.	.	208	208
SABIC INNOVATIVE PLASTICS US	.	.	100	20	120
INTERPLASTIC CORP	.	.	.	0	0
HEXCEL CORP	.	.	776	.	776
ASHLAND LLC	.	1,806	.	51	1,857
325520 Adhesive Manufacturing					
BOSTIK MANUFACTURING PLNT	.	.	2	.	2
CYTEC AEROSPACE MATERIALS	.	.	.	0	0
3M CO - SPRINGFIELD	.	.	13	0	13
CYTEC SOLVAY COMPOSITE MATERIALS ANAHEIM	.	.	.	226	226
325991 Custom Compounding of Purchased Resins					
SUMITOMO BAKELITE NA INC	170	.	.	29	199
SOLEPOXY INC	.	.	10	1,304	1,314
RAVAGO MANUFACTURING AMERICAS	.	.	.	3,429	3,429
TRINITY SPECIALTY COMPOUNDING	.	.	0	484	484
MILLER WASTE MILLS (DBA RTP)	.	.	.	42	42
CHROMA CORP	.	.	0	20	20
MITSUBISHI CHEMICAL CARBON FIBER & COMPOSITES INC	.	.	.	381	381
325998 All Other Miscellaneous Chemical Product and Preparation Manufacturing					
INTELLIPAK LTD	.	.	.	.	.
326130 Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing					
TENCATE ADV COMPOSITES	.	456	.	.	456

326199 All Other Plastics Product Manufacturing						
	A SCHULMAN CCNE	.	.	0	46	46
	PRECISION PLASTICS INC	25	.	.	0	25
	PLASTECH CORP	.	.	.	0	0
	MISSION PLASTICS NORTH	23	.	.	76	99
	3D PLASTICS INC	496	.	.	.	496
333249 Other Industrial Machinery Manufacturing						
	LMR PLASTICS	41,870	.	.	0	41,870
334413 Semiconductor and Related Device Manufacturing						
	PARKER HANNIFIN CORP CHOMERICS DIV	.	.	40	0	40
334419 Other Electronic Component Manufacturing						
	ISOLA USA CORP	.	.	6,234	.	6,234
335931 Current-Carrying Wiring Device Manufacturing						
	COOPER POWER SYSTEMS LLC	.	.	.	90	90
336411 Aircraft Manufacturing						
	DASSAULT FALCON JET CORP	.	.	.	38	38
	NORDAM I&S DIV	.	.	.	0	0
	BOEING COMMERCIAL AIRPLANES - EVERETT	.	.	628	0	628
336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing						
	GENERAL DYNAMICS MISSION SYSTEMS INC	.	.	.	290	290
	PARK AEROSPACE TECHNOLOGIES CORP	.	555	.	1	557
	NORDAM REPAIR DIV	.	.	.	0	0
	THE GILL CORP	.	.	.	.	.
	HEXCEL CORP	.	1,508	0	0	1,508
	HEATH TECNA INC	.	.	224	0	224
562211 Hazardous Waste Treatment and Disposal						
	TRADEBE TREATMENT & RECYCLING LLC	.	6	4	129	139
	WAYNE DISPOSAL INC	.	.	.	5,781	5,781
	EQ DETROIT INC	.	.	3,738	2,043	5,781
	CLEAN HARBORS DEER PARK	.	.	3	0	3
	US ECOLOGY IDAHO INC	.	.	.	204	204
	CLEAN HARBORS GRASSY MOUNTAIN LLC	.	.	.	146	146
	US ECOLOGY NEVADA INC	.	.	.	2,380	2,380
TOTAL		**42,584**	**4,362**	**12,120**	**74,290**	**133,356**

Source:
2017 TRI Data (updated April, 2019).
Notes:
These data are taken from Part II, Section 8, and include on-site and off-site activities. "Recycling" is the sum of 8.4 and 8.5; "Energy Recovery" is the sum of 8.2 and 8.3; "Treatment" is the sum of 8.6 and 8.7; and "Releases" is the sum of 8.1a through 8.1d. "Total Production Related Waste" is the sum of 8.1 through 8.7, or the other columns presented in the table. Note that this section includes all of the pounds reported in Part II, Sections 5 and 6, and also includes additional waste management activities. For more information see the TRI Guide Me page for Section 8.[2]
Because this table includes both on-site and off-site facilities, the "Number of Facilities" column includes both types. For off-site facilities, FRS identifiers are used to reduce double-counting; that is, off-site facilities with the same FRS ID are assumed to be the same and counted once. Similarly, off-site facilities with exact text matches for name and address are only counted once. Blank or incomplete off-site records are only counted once. Facilities that report zero rather than "NA" are included in the counts.
[a] "Releases" is the sum of 8.1a through 8.1d on Form R. These categories are:
- Total on-site disposal to Class 1 underground Injection Wells, RCRA Subtitle C Landfills, and other Landfills
- Total other on-site disposal or other releases
- Total off-site disposal to Class I Underground Injection Wells, RCRA Subtitle C landfills, and other landfills
- Total other off-site disposal of other releases.

[b] Does not include releases due to one-time event not associated with production such as remedial actions or earthquakes.

2.3.7 TRI Releases to the Environment

Table 2-14 shows that 11,311 pounds of TBBPA was released to the environment by the 53 facilities, by release category. The majority of the chemical that is released to the environment (8,511 pounds) is released to RCRA Subtitle C Landfills.

Table 2-14: Summary of TBBPA TRI Releases to the Environment in 2017 (lbs)

Number of Facilities	Air Releases		Water Releases	Land Releases			Total Releases[b]
	Stack Air Releases	Fugitive Air Releases		Class I Under-ground Injection	RCRA Subtitle C Landfills	All other Land Releases[a]	
53	2,109	514	26	50	8,511	100	11,311

Source:
2017 TRI Data (updated April, 2019).
Notes:
These data are taken from Part II, Section 5 of the Form R, and include only on-site releases (at the site of the TRI-reporting facility, rather than an off-site facility where waste is transferred from the reporting facility). Note that zero can indicate 0.5 pounds or less, including zero. Facilities are instructed to use "NA" if the chemical is not released to a certain medium, and those facilities are not included in these counts.
[a] Terminology used in these columns may not match the more detailed data element names used in the TRI public data and analysis access points.
[b] These release quantities do include releases due to one-time events not associated with production such as remedial actions or earthquakes.

2.3.8 TRI Waste Treatment by Waste Type

Table 2-15 summarizes the amount of TBBPA and the number of reporting sites associated with each release category reported under the 2017 TRI.

[2] https://ofmpub.epa.gov/apex/guideme_ext/f?p=guideme:rfi:::::rfi:4_8_1_1

Table 2-15: Summary of 2017 TRI Releases for Phthalic Anhydride				
Waste Type	**Release Category**	**TRI Category**	**Volume from TRI (lbs)**	**Number of Reporting Sites from TRI**
Emissions to Air	Emissions to Air	Fugitive Air	514	33
		Stack Air	2,109	32
Other Release Totals	Other Release Totals	Total Production Related Waste	133,356	50
		Total One-Time Release Waste	0	2
		Total Waste Managed	133,356	50
Solid Wastes	Hazardous and Municipal Waste Landfills	RCRA Subtitle C Landfills	10,687	7
		Other Landfills	56,870	29
	Other Land Releases	Land treatment / application	.	0
		Other land treatment	3,638	11
	Surface Impoundments	RCRA Subtitle C surface impoundments	.	0
		Other surface impoundments	.	0
	Waste Treatment and Management Methods	Off-site Incineration	7,728	13
		Onsite Treatment	502	5
		Energy Recovery	4,362	14
		Other Off-site treatment	4,271	10
		Transfer to Storage-Only Facility	.	0
		Recycling	42,584	6
Wastewater or Liquid Wastes	Industrial Pre-Treatment (indirect discharge)	POTW	10	10
	Industrial WWT (direct discharge)	Water	26	9
	Industrial WWT (indirect discharge)	Off-site WWT (non-POTW)	4	3
	Underground Injection	Class I Underground Injection	50	1
		Class II-V Underground Injection	.	0

Source:
2017 TRI Data (updated April, 2019).

Notes:
This table includes data from Part II, Sections 5, 6, and 8 of the Form R. The last column shows each volume as the percent of total waste managed. Total waste managed is used as the denominator, rather than production-related waste managed, because Sections 5 and 6 include one-time released waste. One-time released waste is shown as a separate item in this table, but it is included in the other categories in the table that are taken from Sections 5 and 6; that is, all of the rows in "Wastewater or Liquid Wastes", "Solid Wastes", and "Emissions to Air" will generally sum to "Total Waste Managed", although in some cases the values may differ slightly (suggested calculated values in TRI reporting software ensure that sums match, but reporting facilities can override those values). Because this table includes both on-site and off-site facilities, the "Number of Facilities" column includes both types. For off-site facilities, FRS identifiers are used to reduce double-counting; that is, off-site facilities with the same FRS ID are assumed to be the same and counted once. Similarly, off-site facilities with exact text matches for name and address are only counted once. Blank or incomplete off-site records are only counted once. Facilities that report zero rather than "NA" are included in the counts.

2.4 Use Information

2.4.1 Summary of Uses

TBBPA is mainly used as a flame retardant, but has also been used as a plasticizer and chemical intermediate for the synthesis of other brominated FRs (NIEHS 2002). Based on the sources described throughout this chapter and in Appendix A, the types of end-use products that are produced using TBBPA are summarized below. These include both ongoing uses and uses that may have been discontinued.

Adhesives

The American Coatings Association (ACA) informed EPA that TBBPA is used as a flame retardant in adhesives and sealants and that specialty products may have amounts above 10% (ACA 2019). The National Institute of Environmental Health Sciences identified the use of TBBPA in adhesives and coatings (NIEHS 2002). Washington State Dept. of Ecology's Children Safe Product Act Reported Data (2019) lists the use of TBBPA in adhesives in jewelry craft supplies (concentration of 100 to 500 ppm). Four facilities in the "Adhesive Manufacturing" sector reported to TRI in 2017 for TBBPA. See Table 2-17 for a list of adhesive products containing TBBPA.

Aerospace Industry

The Aerospace Industry Association (AIA) informed EPA that TBBPA is used as an adhesive (films and epoxy) and in prepreg used by the aerospace industry (AIA 2019). Specifically, AIA noted that TPPBA is used for its flame retardance and temperature stability properties on structural film adhesives, resins for honeycomb core, and in epoxy pre-impregnated fiberglass or graphite tapes or woven fabrics. According to AIA, TBBPA-containing materials are qualified for use in company proprietary specifications and are certified/approved by civil aviation airworthiness authorities and DoD customers used by the aerospace industry. At least two products for the aerospace industry are identified in Table 2-17.

Building/Construction Materials

One company, Lintech International Inc., reported to CDR (U.S. EPA 2017) that it is used as a processing aid in plastic material and resins manufacturing, to make building/construction materials. The Government of Canada's Screening Assessment Report for TBBPA (Canada 2013) states that it is used flame-retardant resins containing TBBPA are found in glass-reinforced construction panels. The Danish EPA's 1999 report states that flame-retarded epoxy resins containing TBBPA are used in the manufacture of glass-reinforced construction panels (Danish EPA 1999).

Chemical Products

Chemtura Corporation, at two sites, reported to CDR (U.S. EPA 2017) that TBBPA is used as an intermediate in chemical product and preparation manufacturing. Two facilities in the "Other Basic Inorganic Chemical Manufacturing" sector reported to TRI in 2017 for TBBPA.

Electrical and Electronic Products

Three companies reported to CDR (U.S. EPA 2017) that TBBPA is used as a flame retardant in electrical equipment, appliance, and component manufacturing and in computer and electronic product manufacturing. The American Chemistry Council in its public comments noted that the main application of TBBPA is in printed circuit boards or laminates (ACC 2019). EPA's *Flame Retardants in Printed Circuit Boards* report states that TBBPA, used as a reactive flame retardant, forms part of the polymeric backbone of resin used in electronic products. TBBPA was used to make the epoxy resin base material in over 90% of FR-4 circuit boards in 2008 (U.S. EPA 2015). The National Institute of Environmental Health Sciences identifies the use of TBBPA in electronic enclosures made of polycarbonate-acrylonitrile-butadiene-styrene, and in integrated circuit chips (NIEHS 2002). The Government of Canada's Screening Assessment Report (2013) states that TBBPA is used to make rigid epoxy-laminated printed circuit boards and terminal boards. Canada (2013) further reports that flame-retarded resins made with TBBPA are used in communications and electronics equipment,

appliances, and lighting fixtures, while acrylonitrile-butadiene-styrene (ABS) resins containing TBBPA are used in refrigerators and other appliances, business machines and telephones. One facility in the "Semiconductor and Related Device Manufacturing" sector, one facility in the "Current-Carrying Wiring Device Manufacturing" sector and one facility in the "Other Electronic Component Manufacturing" sector reported to TRI in 2017 for TBBPA. See Table 2-17 for electronic products containing TBBPA.

Paper

One facility in the "Paper Bag and Coated and Treated Paper Manufacturing" sector reported to TRI in 2017 for using TBBPA as a formulation component. The National Institute of Environmental Health Sciences identifies use of TBBPA as a flame retardant in the manufacturing of paper (NIEHS 2002).

Plastic Products and Resins

One company, Sabic Innovative Plastics, reported to CDR (U.S. EPA 2017) that TBBPA is used as a flame retardant in plastics product manufacturing. According to the Government of Canada's Screening Assessment Report (2013), TBBPA is incorporated into polymers as a reactive or additive flame retardant for use in flame-retarded epoxy and polycarbonate resins and, to a lesser extent, in acrylonitrile-butadiene-styrene (ABS) resins and phenolic resins. Applications of flame-retarded polycarbonate resins include communications and electronics equipment, appliances, transportation devices, sports and recreation equipment, lighting fixtures and signs. ABS resins containing TBBPA are used in automotive parts, pipes and fittings, refrigerators and other appliances, business machines and telephones. The European Chemicals Agency (ECHA) registration dossier for TBBPA (ECHA 2019) identifies the use of TBBPA as a reactive intermediate in the manufacture of polymer resins, and in the manufacture of polymer resins/articles containing additive flame retardant, in European countries. Ten facilities in the "Plastics Material and Resin Manufacturing" sector and five facilities in the "All Other Plastics Product Manufacturing" reported to TRI in 2017 for TBBPA. One facility in the "Other Industrial Machinery Manufacturing" sector also reported to TRI in 2017 for TBBPA; this company, LMR Plastics, is a thermoplastic injection molding company. See Table 2-17 for products used in plastic manufacturing, that were identified as containing TBBPA.

Textiles

The National Institute of Environmental Health Sciences identifies the use of TBBPA as a flame retardant in textiles, and further states that TBBPA is applied to carpeting and office furniture (NIEHS 2002). Washington State Dept. of Ecology's Children Safe Product Act Reported Data (2019) lists the use of TBBPA as a flame retardant in textiles used in: baby car and booster seats available for consumer use (concentration equal to or greater than 10,000 ppm in another); baby carriers (concentration equal to or greater than 10,000 ppm); baby swings (concentration equal to or greater than 10,000 ppm); and baby play pens and dens (concentration equal to or greater than 10,000 ppm). Two facilities in the "Fabric Coating Mills" sector reported to TRI in 2017 for TBBPA.

Transportation Equipment

One company, Huntsman Corporation – The Woodlands Corporate Site, reported to CDR (U.S. EPA 2017) that TBBPA is used as an intermediate in transportation equipment manufacturing, for industrial manufacturing. The Government of Canada's Screening Assessment Report (Canada 2013)

states that TBBPA is used to make motor housings, and that ABS resins containing TBBPA are used in automotive parts. Six facilities in the "Other Aircraft Parts and Auxiliary Equipment Manufacturing" sector and three facilities in the "Aircraft Manufacturing" sector reported to TRI in 2017 for TBBPA. An ABS product made by LG Chem was identified as containing TBBPA and used in automobile interior housing (see Table 2-17).

2.4.2 Tier 1 Uses of TBBPA

Uses are divided into Tier 1 and Tier 2 uses. Those in Tier 1 generally have more information to support the accuracy of the use. For instance, these uses may be identified from sources where manufacturers and producers self- report the information or have been confirmed by identification of the chemical on a product SDS. They are found in Table 2-16. Tier 2 uses are other uses that may be historic, non-TSCA use, or more anecdotal are found in the table in Appendix B.

Table 2-16: Tier 1 Uses of TBBPA

Activity or Chemical Function	Sector or Product Type	Expected Users	Comments and References
Manufacturing			
Manufacture		Industrial	U.S. EPA 2017 The 2016 CDR reports manufacture of TBBPA.
Import		Industrial	U.S. EPA 2017 The 2016 CDR reports import of the TBBPA.
Processing			
Processing as a reactant	All other chemical product and preparation manufacturing	Industrial	U.S. EPA 2017 The 2016 CDR reports use of TBBPA as an intermediate for processing (as a reactant) the all other chemical product and preparation manufacturing sector.
Processing as a reactant	Plastic material and resin manufacturing	Industrial	U.S. EPA 2017, ECHA 2019, EFSA 2013 The 2016 CDR reports use of TBBPA as a flame retardant for processing (as a reactant) in plastic material and resin manufacturing. The ECHA registration dossier (European countries) identifies the use of TBBPA as a reactive intermediate in the manufacture of polymer resins. The European Food Safety Authority (EFSA) claims that TBBPA, primarily used as a reactive flame retardant, is used as a reactive intermediate in polymer manufacture.
Processing as a reactant	Transportation equipment manufacturing	Industrial	U.S. EPA 2019 According to 2017 TRI data, two companies in the "other aircraft parts and auxiliary equipment manufacturing" sector use TBBPA as a reactant.

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Incorporation into formulation, mixture, or reaction product	Adhesive Manufacturing	Industrial	U.S. EPA 2019, NIEHS 2002 The 2017 TRI reports use of TBBPA as a formulation component in adhesive manufacturing. The National Institute of Environmental Health Sciences identified the use of TBBPA as a plasticizer in adhesives and coatings.
Incorporation into formulation, mixture, or reaction product	Computer and electronic product manufacturing	Industrial	U.S. EPA 2017, U.S. EPA 2014, U.S. EPA 2015, NIEHS 2002 The 2016 CDR and the 2012 CDR report use of TBBPA as a flame retardant for processing (incorporation into formulation, mixture, or reaction product) in computer and electronic product manufacturing. EPA's *Flame Retardants in Printed Circuit Boards* report states that TBBPA, used as a reactive flame retardant, forms part of the polymeric backbone of resin used in electronic products. TBBPA was used to make the epoxy resin base material in over 90% of FR-4 circuit boards in 2008. The National Institute of Environmental Health Sciences stated that TBBPA is primarily used as a reactive flame retardant in epoxy resin circuit boards, and that in encapsulations for integrated circuit chips, TBBPA is incorporated into the epoxy polymer structure after curing.
Incorporation into formulation, mixture, or reaction product	Electrical equipment, appliance, and component manufacturing	Industrial	U.S. EPA 2017, NIEHS 2002, Canada 2013 The 2016 CDR report use of TBBPA as a flame retardant for processing (incorporation into formulation, mixture, or reaction product) in electrical equipment, appliance, and component manufacturing. The National Institute of Environmental Health Sciences states that TBBPA is used as a reactive flame retardant in electronic enclosures made of polycarbonate-acrylonitrile-butadiene-styrene. The Government of Canada's Screening Assessment Report states that estimates for TBBPA use as a reactive flame retardant in epoxy and polycarbonate resins and/or electrical and electronic equipment range from 70 to 90%.
Incorporation into formulation, mixture, or reaction product	Miscellaneous manufacturing	Industrial	U.S. EPA 2017 The 2016 CDR report use of TBBPA for processing (incorporation into formulation, mixture, or reaction product) in miscellaneous manufacturing.

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Incorporation into formulation, mixture, or reaction product	Plastic material and resin manufacturing	Industrial	U.S. EPA 2017, U.S. EPA 2014, NIEHS 2002, Canada 2013 The 2016 CDR and the 2012 CDR report use of TBBPA as both a flame retardant and a processing aid for processing (incorporation into formulation, mixture, or reaction product) in plastic material and resin manufacturing. The National Institute of Environmental Health Sciences states that TBBPA is used as a flame retardant for plastics. The Government of Canada's Screening Assessment Report states that TBBPA is incorporated into polymers as a reactive or additive flame retardant for use in flame-retarded epoxy and polycarbonate resins and, to a lesser extent, in acrylonitrile-butadiene-styrene (ABS) resins and phenolic resins. Estimates for TBBPA use as an additive to plastics (e.g. ABS and phenolic resins) range from 10 to 20%
Incorporation into formulation, mixture, or reaction product	Plastics product manufacturing	Industrial	U.S. EPA 2017 The 2016 CDR report use of TBBPA as a flame retardant for processing (incorporation into formulation, mixture, or reaction product) in plastics product manufacturing.
Incorporation into formulation, mixture, or reaction product	Transportation equipment manufacturing	Industrial	U.S. EPA 2017, U.S. EPA 2019 The 2016 CDR report use of TBBPA as an intermediate for processing (incorporation into formulation, mixture, or reaction product) in transportation equipment manufacturing. According to 2017 TRI data, one aircraft manufacturing company and one company in the "other aircraft parts and auxiliary equipment manufacturing" sector use TBBPA as a formulation component.
Incorporation into article	Adhesive Manufacturing	Industrial	U.S. EPA 2019 The 2017 TRI reports use of TBBPA as an article component in adhesive manufacturing.

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Incorporation into article	Electrical equipment, appliance, and component manufacturing	Industrial	U.S. EPA 2017, ECHA 2019 The 2016 CDR report use of TBBPA as a flame retardant for processing (incorporation into article) in electrical equipment, appliance, and component manufacturing. The ECHA registration dossier (European countries) identifies the use of TBBPA in the manufacture of polymer articles from polymer resins containing additive flame retardant, in the manufacture of computer, electronic and optical products, electrical equipment sector.
Incorporation into article	Plastics product manufacturing	Industrial	U.S. EPA 2017, ECHA 2019 The 2016 CDR report use of TBBPA as a flame retardant for processing (incorporation into article) in plastics product manufacturing. The ECHA registration dossier (European countries) identifies the use of TBBPA in the manufacture of polymer articles from polymer resins containing additive flame retardant, in the manufacture of plastics products sector.
Incorporation into article	Textile manufacturing	Industrial	NIEHS 2002 The National Institute of Environmental Health Sciences identified the use of TBBPA as a flame retardant in textiles.
Incorporation into article	Transportation equipment manufacturing	Industrial	U.S. EPA 2019 According to 2017 TRI data, two aircraft manufacturing companies and four companies in the "other aircraft parts and auxiliary equipment manufacturing" sector use TBBPA as an article component.

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Consumer and Commercial Use			
Component of plastic resin or polymer process	Plastic products (jewelry craft supplies)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists the use of TBBPA as a component of plastic resin or polymer process in jewelry craft supplies (two instances, 500 to 1,000 ppm) The current use or availability of these products is unknown. (Considered Tier 1 because TBBPA is commonly used in plastics.)
Flame retardant	Electrical and electronic products	Consumer/ Commercial	U.S. EPA 2017, U.S. EPA 2014, U.S. EPA 2015, Canada 2013 The 2016 CDR and the 2012 CDR report commercial/consumer use of TPPBA in electrical and electronic products. EPA's *Flame Retardants in Printed Circuit Boards* report states that TBBPA, used as a reactive flame retardant, forms part of the polymeric backbone of resin used in electronic products. TBBPA was used to make the epoxy resin base material in over 90% of FR-4 circuit boards in 2008. Canada's screening assessment report states that ABS resins containing TBBPA are used in refrigerators and other appliances, business machines, and telephones.
Flame retardant	Machinery, equipment, vehicles, other transport equipment	Consumer/ Commercial	ECHA 2019, Canada 2013, U.S. EPA 2019 The ECHA registration dossier (European countries) identifies the use of TBBPA in the manufacture of polymer articles from polymer resins containing additive flame retardant, in the general manufacturing, e.g. machinery, equipment, vehicles, other transport equipment sector. Canada's screening assessment report states that ABS resins containing TBBPA are used in automotive parts, pipes and fittings. (Considered Tier 1 because TBBPA is commonly used in plastics).
Flame retardant	Paper products	Consumer/ Commercial	NIEHS 2002, U.S. EPA 2019 The National Institute of Environmental Health Sciences identified the use of TBBPA as a flame retardant for paper. Under the 2017 TRI, a paper bag and coated and treated paper manufacturing company reported use of TBBPA as a formulation component.

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Flame retardant	Toys and Games	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists seven instances of the use of TBBPA (since 2015) as a flame retardant used in toys and games. This includes indoor/outdoor games, outdoor play structures, and powered viewing toys (500 to 1,000 ppm). The current use or availability of these products is unknown.
Unknown	Building/ construction materials not covered elsewhere	Commercial	U.S. EPA 2017, Danish EPA 1999 The 2016 CDR reports commercial use of TPPBA in building/construction materials. The Danish EPA's 1999 report states that flame-retarded epoxy resins containing TBBPA are used in the manufacture of glass-reinforced construction panels.
Unknown	Industrial Manufacturing	Commercial	U.S. EPA 2017 The 2016 CDR reports commercial use of TPPBA in industrial manufacturing.
Unknown	Plastic and Rubber Products not covered elsewhere	Commercial	U.S. EPA 2014 The 2012 CDR reports commercial use of TPPBA in plastic and rubber products
Recycling and Disposal			
Recycling	All Other Plastics Product Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was recycled by PRECISION PLASTICS INC (24.8 lb); MISSION PLASTICS NORTH (23 lb); and 3D PLASTICS INC (496 lb);
Disposal – stack air	Fabric Coating Mills	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by CYTEC SOLVAY COMPOSITE MATERIALS ORANGE
Recycling	Custom Compounding of Purchased Resins	Industrial	U.S. EPA 2019 2017 TRI data reports that SUMITOMO BAKELITE NA INC recycled 170 lbs of TBBPA
Recycling	Other Industrial Machinery Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was recycled by LMR PLASTICS (41,870 lb)
Disposal – stack air	Adhesive Manufacturing	Industrial	U.S. EPA 2019

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
			2017 TRI data reports that TBBPA was released via stack air by CYTEC SOLVAY COMPOSITE MATERIALS ANAHEIM
Disposal – stack air	Current-Carrying Wiring Device	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by COOPER POWER SYSTEMS LLC
Disposal – stack air	Custom Compounding of Purchased Resins	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by SUMITOMO BAKELITE NA INC; SOLEPOXY INC; RAVAGO MANUFACTURING AMERICAS; TRINITY SPECIALTY COMPOUNDING; CHROMA CORP
Disposal – stack air	Hazardous Waste Treatment and Disposal	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by US ECOLOGY NEVADA INC
Disposal – stack air	Other Aircraft Parts and Auxiliary	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by PARK AEROSPACE TECHNOLOGIES CORP
Disposal – stack air	Other Basic Inorganic Chemical	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by ALBEMARLE CORP SOUTH PLANT
Disposal – stack air	Plastics Material and Resin Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by SABIC INNOVATIVE PLASTICS MT VERNON LLC; ASHLAND PERFORMANCE MATERIALS PHILADELPHIA PLANT; HUNTSMAN ADVANCED MATERIALS AMERICAS INC; CYTEC ENGINEERED MATERIALS INC; SABIC INNOVATIVE PLASTICS US LLC, ASHLAND LLC
Disposal – stack air	Semiconductor and Related Device	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via stack air by PARKER HANNIFIN CORP CHOMERICS DIV
Disposal – fugitive air	All Other Plastics Product Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by PRECISION PLASTICS INC

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
Disposal – fugitive air	Fabric Coating Mills	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by AXIOM MATERIALS
Disposal – fugitive air	Custom Compounding of Purchased Resins	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by SOLEPOXY INC; TRINITY SPECIALTY COMPOUNDING; MITSUBISHI CHEMICAL CARBON FIBER & COMPOSITES INC
Disposal – fugitive air	Hazardous Waste Treatment and Disposal	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by WAYNE DISPOSAL INC; CLEAN HARBORS GRASSY MOUNTAIN LLC; US ECOLOGY NEVADA INC
Disposal – fugitive air	Other Basic Inorganic Chemical	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by ALBEMARLE CORP SOUTH PLANT
Disposal – fugitive air	Plastics Material and Resin Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was released via fugitive air by HUNTSMAN ADVANCED MATERIALS AMERICAS INC; CYTEC ENGINEERED MATERIALS INC; SABIC INNOVATIVE PLASTICS US LLC
Disposal – water	Plastics Material and Resin Manufacturing	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was disposed of via release to water by SABIC INNOVATIVE PLASTICS MT VERNON LLC
Disposal – Class I underground injection	Other Basic Inorganic Chemical	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was disposed of via Class I underground injection by ALBEMARLE CORP SOUTH PLANT
Disposal – RCRA Subtitle C Landfills	Hazardous Waste Treatment and Disposal	Industrial	U.S. EPA 2019 2017 TRI data reports that TBBPA was disposed of via RCRA Subtitle C Landfill by US ECOLOGY IDAHO INC, CLEAN HARBORS GRASSY MOUNTAIN LLC, US ECOLOGY NEVADA INC
Disposal – Other Land Release	Other Basic Inorganic Chemical	Industrial	U.S. EPA 2019

Table 2-16: Tier 1 Uses of TBBPA			
Activity or Chemical Function	**Sector or Product Type**	**Expected Users**	**Comments and References**
			2017 TRI data reports that TBBPA was disposed of via other land release by ALBEMARLE CORP SOUTH PLANT

2.5 Products Containing TBBPA

This section includes a sample of products containing TBBPA, based on the most recent SDS for each product that was found. This is not a comprehensive list of products containing TBBPA. In addition, some manufacturers may appear over-represented in this table. This may mean that they are more likely to disclose product ingredients online than other manufacturers, but does not imply anything about use of the chemical compared to other manufacturers in this sector.

Additionally, the existence of an SDS for a product SDS does not necessarily mean that it the product currently contains TBBPA or that the product is still on the market. EPA attempted to locate the most recent SDS for each product (and does not include in the table any products for which the previous, but not the current, SDS lists TBBPA). Products considered to be "currently on the market" as indicated in the sixth column in Table 2-17 are those that were identified as currently for sale (e.g. through an online vendor or by requesting a quote from the manufacturer), as of December 2019.

Table 2-17: Products Potentially Containing TBBPA, based on SDS						
Use	**Expected Users**	**Product**	**Manufacturer**	**Percent in Product**	**Currently on Market?**	**Source**
Adhesives and Coatings						
Ablative (sacrificial) coating and adhesive used protect the decks and launchings systems on ships from extremely high heat	Industrial (Military)	Havaflex TA-117 (Part "A")	AMETEK Chemical Products Division	Proprietary	No evidence found	Ametek 2006
Adhesive film	Industrial	FM 300-2 Adhesive Film	Cytec	3.9%	Yes	Cytec 2015 Pacific Coast Composites 2019a
Adhesive film	Industrial	FM 377S Adhesive Film	Cytec	1 to 2%	Yes	Cytec 2013 Pacific Coast Composites 2019b
Epoxy adhesive	Consumer	LOCTITE ABLESTIK 8260LV known as Ablebond 8260LV	Henkel Corporation	0.25 to 2.5%	No evidence found	Henkel 2014a
Epoxy film adhesive	Industrial (Aviation)	LOCTITE EA 9690 Aero (known as Hysol XEA 9690)	Henkel Corporation	5 to 10%	Yes	Henkel 2014b GracoRoberts 2019
Electronics						
Casing of Li-ion Rechargeable Battery Pack	Consumer	Sanyo Li-ion Battery 18650	Chi Mei Corporation	< 13%	Yes	Chi Mei 2013 Orbtronic 2019
Container/ cover of a rechargeable lead acid battery	Commercial/ consumer	SolaHD Sealed Lead-Acid Battery (Valve Regulated Lead Acid Battery)	Yuasa	4% or below	No evidence found	Yuasa 2016
Laminated sheet material for electronics (prepreg)	Industrial	HTE-80B	Hong Tai Electric Industrial Co., Ltd.	< 0.5%	No evidence found	HTE 2019
Plastic cover of a urine analyzer	Commercial/ consumer	McKesson U120 Urine Analyzer	McKesson Medical-Surgical Inc.	< 17%	Yes	McKesson 2015 Cascade 2019

Table 2-17: Products Potentially Containing TBBPA, based on SDS						
Use	**Expected Users**	**Product**	**Manufacturer**	**Percent in Product**	**Currently on Market?**	**Source**
Resin impregnated woven fiberglass used in the manufacture or copper-clad laminate for printed circuit boards	Industrial	IS620 PREPREG	Isola	5 to 10%	No evidence found	Isola 2015
Flame retardant additive						
Flame retardant	Industrial	Saytex CP-2000	Albemarle	100%	Yes	Albemarle 2017 HM Royal 2019
Plastic Products (Manufacture of)						
3D Printing Filament	Commercial/ consumer	Firewire® Flame Retardant ABS	3DXTECH	> 10%	Yes	3DXTECH 2017 3DXTECH 2019
Manufacture of plastic products (Automotives interior housing)	Industrial	ABS AF312A	LG Chem	15 to 20%	Yes	LG Chem 2013 LG Chem 2019
Manufacture of plastic products (circuit boards for electronic devices)	Industrial	BA-59P	Lanxess	59%	Likely	Lanxess 2017 Lanxess 2018
Manufacture of plastic products	Industrial	ABS Resin (TAIRILAC ANC100, TAIRILAC ANC120, ANC150, ANC160)	Formosa Chemicals & Fibre Corporation	< 17%	Yes	Formosa Chemicals 2016 Knowde 2019
Plastic materials of synthetic resin	Industrial	ABS_FR VH-0800	Samsung SDI CO., LTD.	15 to 20%	No evidence found	Samsung 2014
Manufacture of plastic products (housing and parts for TV, calculators, photocopiers, VCR, cash registers, fax machine, PC monitors, modems, scanners, electrical appliances, multifunctional peripherals etc.)	Industrial	FR Acrylonitrile-Butadiene-Styrene Copolymer (D1000S/D1200/D1000A/ D1000)	Grand Pacific Petrochemical Corporation	< 20%	Likely	Grand Pacific 2014 Grand Pacific 2019
Production of molded plastic articles	Industrial	Polylac® FR-ABS	Chi Mei Corporation	< 17%	Yes	Chi Mei 2018 Distrupol 2019

Table 2-17: Products Potentially Containing TBBPA, based on SDS						
Use	**Expected Users**	**Product**	**Manufacturer**	**Percent in Product**	**Currently on Market?**	**Source**
Production of plastic articles	Industrial	ELIX ABS (flame retardant) (ELIX 021)	ELIX Polymers	< 30%	No evidence found	ELIX Polymers 2013
Transportation						
Reinforced fiberglass (for aerospace)	Industrial	E-761 Epoxy Prepreg/Fiberglass Reinforced	Park Electrochemical Corp.	1 to 6%	Likely	Park 2015 Park 2019
Other						
Casting compound	Industrial (Aviation)	Loctite Stycast EE 1067 (Hysol EE 1067)	Henkel Corporation	1 to 5%	Likely	Henkel 2018 Boeing 2019
Casting compound (general purpose flame retardant)	Industrial	Loctite Stycast EE 1068 (Hysol EE 1068)	Henkel Corporation	1 to 5%	No evidence found	Henkel 2019
Controlled flow epoxy resin for lamination	Industrial	HexPly F155 Prepreg	Hexcel	3 to 14%	Yes	Hexcel 2013 Heatcon 2019
Cross Linking polymer	Industrial	SA30-40 Part 1 Powder	Mix 14 Limited	5 to 50%	Yes	Satto 2016 Satto 2019
Hardener (Crosslinker)	Industrial	SA20-21 – PART B POWDER	Mix 14 Limited	10 to 30%	Yes	Satto 2018 Satto 2019
Molding compound	Industrial	MG21F-02 48 MM X 50 GMS, BUL #	Henkel Limited	0.25 to 2.5%	No evidence found	Henkel 2015

3. Waste, Disposal, and Recycling

3.1 National Emissions Inventory Data

TBBPA is not reported to the National Emissions Inventory.

3.2 RCRA Data

TBBPA is not reported through RCRA.

4. References

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Appendix A: Search Methodology

To compile the uses, EPA searched publicly available databases listed in Table A-1 and conducted additional Google searches to clarify uses or find current products in commerce.

Table A-1: Sources Searched for Uses of TBBPA

Title	Author and Year	Search Term(s)	Found Use Information?
Sources searched for all use reports			
California Links to Pesticides Data	California Dept of Pesticide Regulation (2013)	79-94-7	No
Canada Chemicals Management Plan information sheets	Government of Canada (2018)	Tetrabromobisphenol A	Yes
Chemical and Product Categories (CPCat)	Dionisio (2015)	79-94-7	No
ChemView	U.S. EPA (2018a)	79-94-7	Yes
Consumer Product Information Database (CPID)	DeLima Associates (2018)	79-94-7	No
Danish surveys on chemicals in consumer products	Danish EPA (1999)	N/A, There is no search but report titles were checked for possible information on the chemical	Yes, but provided information found in other sources
Datamyne	Descartes Datamyne (2018)	"79-94-7" OR "4,4'-(1-Methylethylidene)bis(2,6-dibromophenol)" OR "TBBPA" OR "2,2,6,6,-Tetrabromobisphenol" OR "2,2-Bis(3,5-dibromo-4-hydroxyphenyl)propane" OR "2,2-Bis(4-hydroxy-3,5-dibromophenyl)propane" OR "3,3,5,5,-tetrabromo-bisphenol A" OR "3,5,3',5'-Tetrabromobisphenol A" OR "4,4'-Isopropylidenebis(2,6-dibromophenol)" OR "4,4'-Isopropylylidenebis(2,6-dibromophenol)" OR "BA 59" OR "Bromdian" OR "FG 2000" OR "Fireguard 2000" OR "Firemaster BP 4A" OR "Greatlakes BA-59P" OR "Great Lakes BA-59P" OR "Phenol, 4,4'-(1-methylethylidene)bis(2,6-dibromo" OR "Phenol, 4,4'-isopropylidenebis(2,6-dibromo" OR "Saytex 111" OR "Saytex RB 100 PC" OR "TBBPA" OR "TBBP-A" OR "TBBP-A" OR "Tetrabromobisphenol A" OR "Tetrabromodian" OR "Tetrabromodiphenylpropane"	Yes
DrugBank	DrugBank (2018)	Tetrabromobisphenol A; TBBPA, 79-94-7	No
European Chemicals Agency (ECHA) Registration Dossier	ECHA (2019)	79-94-7	Yes
eChemPortal	OECD (2018)	79-94-7	Yes
Envirofacts	U.S. EPA (2018b)		

Table A-1: Sources Searched for Uses of TBBPA			
Title	**Author and Year**	**Search Term(s)**	**Found Use Information?**
Functional Use Database (FUse)	U.S. EPA (2017)	79-94-7	Yes
Kirk-Othmer Encyclopedia of Chemical Technology	Kirk-Othmer (2006)	Tetrabromobisphenol A; TBBPA, 79-94-7	No
National Emissions Inventory (NEI)	U.S. EPA (2014)	79-94-7	No
Non-Confidential 2016 Chemical Data Reporting (CDR)	U.S. EPA (2017b)	79-94-7	Yes
PubChem Compound	U.S. NLM (2019)	79-94-7	Yes
Safer Chemical Ingredients List (SCIL)	U.S. EPA (2018)	79-94-7	No
Synapse Information Resources	Synapse Information Resources (n.d.)		
Resource Conservation and Recovery Act (RCRA)	U.S. EPA	79-94-7	No
Scorecard: The Pollution Information Site	GoodGuide (2019)	79-94-7	Yes
Skin Deep Cosmetics Database	EWG (2018)	79-94-7	No
Toxics Release Inventory (TRI)	U.S. EPA (2019)	79-94-7	Yes
TOXNET	U.S. NLM (2018)	79-94-7	Yes
Ullmann's Encyclopedia of Industrial Chemistry	Ullmann's (2000)	Tetrabromobisphenol A; TBBPA, 79-94-7	No
Washington State Department of Ecology Children's Safe Product Act Reported Data	Washington State Department of Ecology (2019)	79-94-7	Yes
Additional Sources Identified from Reasonably Available Information			
Government of Canada Screening Assessment Report (SAR)	Government of Canada (2013)	Incidentally identified while researching into details of this chemical's uses and products.	Yes
DfE Alternatives Analysis	U.S. EPA (2015)		
Manufacturer Safety Data Sheets (MSDS)	See section 2.6 for list		

The U.S. Patent and Trademark Office has an online database that shows 4,590 patents referencing "Tetrabromobisphenol A" (USPTO 2019). Although patents could be useful in determining reasonably foreseeable uses, the information can be extremely technical, and it is difficult to confirm whether any of the patented technologies are currently in use. Therefore, uses inferred from patents containing TBBPA were not included in this report.

Appendix B: Additional TRI Data

Table B-1: Facilities Reporting Under TRI for TBBPA in 2017

Facility Name	City	State	TRI Facility ID	Number of Facilities
313320 Fabric Coating Mills				2
CYTEC SOLVAY COMPOSITE MATERIALS ORANGE	Orange	CA	92669FBRTX645NC	
AXIOM MATERIALS	Santa Ana	CA	9270WXMMTR2322P	
322220 Paper Bag And Coated And Treated Paper Manufacturing				1
LAMART CORP	Clifton	NJ	07011LMRTC16RIC	
325180 Other Basic Inorganic Chemical Manufacturing				2
GREAT LAKES CHEMICAL - CENTRAL	El Dorado	AR	71731GRTLKHIGHW	
ALBEMARLE CORP SOUTH PLANT	Magnolia	AR	71753THYLCROUTE	
325211 Plastics Material And Resin Manufacturing				10
SABIC INNOVATIVE PLASTICS US LLC	Selkirk	NY	12158GNRLLNORYL	
ASHLAND PERFORMANCE MATERIALS PHILADELPHIA PLANT	Philadelphia	PA	19148SHLND2801S	
HUNTSMAN ADVANCED MATERIALS AMERICAS INC	Mc Intosh	AL	36553HNTSM555HU	
AOC LLC TENNESSEE PLANT	Collierville	TN	38017LPHRSHIGHW	
SABIC INNOVATIVE PLASTICS MT VERNON LLC	Mount Vernon	IN	47620GPLSTLEXAN	
CYTEC ENGINEERED MATERIALS INC	Winona	MN	55987CCMPS501W3	
SABIC INNOVATIVE PLASTICS US LLC	Ottawa	IL	61350BRGWRCANAL	
INTERPLASTIC CORP	Pryor	OK	74362NTRPLHUNTS	
HEXCEL CORP	West Valley City	UT	84044HRCLS6800W	
ASHLAND LLC	Commerce	CA	90040SHLND6608E	
325520 Adhesive Manufacturing				4
BOSTIK MANUFACTURING PLANT	Middleton	MA	01949BSTKDBOSTO	
CYTEC AEROSPACE MATERIALS	Havre De Grace	MD	21078MRCNC1300R	
3M CO - SPRINGFIELD	Springfield	MO	65802MXXXX3211E	
CYTEC SOLVAY COMPOSITE MATERIALS ANAHEIM	Anaheim	CA	92806BSFST1440N	
325991 Custom Compounding Of Purchased Resins				7
SUMITOMO BAKELITE NA INC	Manchester	CT	06430RGRSCMILLA	
SOLEPOXY INC	Olean	NY	14760HYSLL211FR	
RAVAGO MANUFACTURING AMERICAS	Manchester	TN	3735WRVGMN45PAR	
TRINITY SPECIALTY COMPOUNDING	West Unity	OH	43570TRNTY6AKST	
MILLER WASTE MILLS (DBA RTP CO)	Winona	MN	55987MLLRW580EF	
CHROMA CORP	Mc Henry	IL	60050CHRMC3900D	
MITSUBISHI CHEMICAL CARBON FIBER & COMPOSITES INC	Irvine	CA	92614NWPRT1822R	
325998 All Other Miscellaneous Chemical Product And Preparation Manufacturing				1
INTELLIPAK LTD	Newbury	OH	44065NTLLP9988K	

Table B-1: Facilities Reporting Under TRI for TBBPA in 2017				
Facility Name	City	State	TRI Facility ID	Number of Facilities
326130 Laminated Plastics Plate, Sheet (Except Packaging), And Shape Manufacturing				1
TENCATE ADVANCED COMPOSITES	Fairfield	CA	9453WTNCTD245CR	
326199 All Other Plastics Product Manufacturing				5
A SCHULMAN CCNE	Worcester	MA	01606CMPLS53MIL	
PRECISION PLASTICS INC	Columbia City	IN	4672WPRCSN9WCNN	
PLASTECH CORP	Rush City	MN	55069PLSTC920SF	
MISSION PLASTICS NORTH	Grandview	MO	64030PTRSN4200E	
3D PLASTICS INC	Newberg	OR	9713WDPLST271E2	
333249 Other Industrial Machinery Manufacturing				1
LMR PLASTICS	Greeneville	TN	3774WLMRPL169IN	
334413 Semiconductor And Related Device Manufacturing				1
PARKER HANNIFIN CORP CHOMERICS DIV	Hudson	NH	03051CHMRC16FLA	
334419 Other Electronic Component Manufacturing				1
ISOLA USA CORP	Chandler	AZ	85224NRPLX165SP	
335931 Current-Carrying Wiring Device Manufacturing				1
COOPER POWER SYSTEMS LLC	Olean	NY	14760CPRPW1648D	
336411 Aircraft Manufacturing				3
DASSAULT FALCON JET CORP	Little Rock	AR	72201FLCNJ10THL	
NORDAM I&S DIV	Tulsa	OK	74117NRDMS691NW	
BOEING COMMERCIAL AIRPLANES - EVERETT	Everett	WA	98203BNGCM3003W	
336413 Other Aircraft Parts And Auxiliary Equipment Manufacturing				6
GENERAL DYNAMICS MISSION SYSTEMS INC	Marion	VA	24354BRNSW150JO	
PARK AEROSPACE TECHNOLOGIES CORP	Newton	KS	6711WPRKRC486NR	
NORDAM REPAIR DIV	Tulsa	OK	74116NRDMM11200	
THE GILL CORP	El Monte	CA	91731MCGLL4056E	
HEXCEL CORP	Kent	WA	98032HTHTC19819	
HEATH TECNA INC	Bellingham	WA	98826BRTXH3225W	
562211 Hazardous Waste Treatment And Disposal				7
TRADEBE TREATMENT & RECYCLING LLC	East Chicago	IN	46312PLLTN4343K	
WAYNE DISPOSAL INC	Belleville	MI	48111WYNDS49350	
EQ DETROIT INC	Detroit	MI	48211SLCTY1923F	
CLEAN HARBORS DEER PARK LLC	La Porte	TX	77536SFTYK2027B	
US ECOLOGY IDAHO INC	Grand View	ID	83624NVRSF1012M	
CLEAN HARBORS GRASSY MOUNTAIN LLC	Grantsville	UT	84074PPMNCI80XX	
US ECOLOGY NEVADA INC	Beatty	NV	89003SCLGYHWY95	

Appendix C: Tier 2 Uses of TBBPA

This appendix contains uses classified as Tier 2. These may be historic, non-TSCA use, or more anecdotal.

Table C-1: Tier 2 Uses of TBBPA

Use	Expected Users	Description of Use or Process and References
Historic		
Resin impregnated woven fiberglass used in the manufacture of copper-clad laminate for printed circuit boards	Industrial/ Commercial	Isola 2015, Isola 2016 TBBPA was listed as a brominated flame retardant ingredient in the material safety data sheet (Isola 2015) of a resin-impregnated woven fiberglass used in the manufacture of copper-clad laminate for printed circuit boards, at a concentration of 1 to 5%. However, a more recent datasheet (Isola 2016) for the same product does not include TBBPA, so this use is assumed to be discontinued. Expected users were computer manufacturers.
Uses with Minimal Substantiation		
Carpeting and office furniture	Commercial / Consumer	NIEHS 2002 The National Institute of Environmental Health Sciences reported that TBBPA is applied to carpeting and office furniture, citing a 1997 source. This is the only source identified that lists use of TBBPA in carpeting and office furniture, though other uses in fabrics are found in other sources.
Toy vehicles	Consumer	Washington State Dept. of Ecology (2019) The Children Safe Product Act Reported Data lists the function of TBBPA as coloration/pigments/dyes/inks in surface coatings (paints, plating, waterproofing etc.) used in powered toy vehicles (non-ride) intended for use by children ages 3 to 12. The source reported 14 instances of this use since 2015, with concentrations of 100 to 500 ppm or greater than 10,000 ppm. The current use or availability of these products is unknown. This is the only source identified that lists use of TBBPA in paints/coatings.
TBBPA as a Contaminant		
Adhesive (jewelry craft supplies)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists the use of TBBPA as an adhesive in jewelry craft supplies available for consumer use, targeted for both children from 3 to 12 years of age. Source identified only a single instance of a product using TBBPA as an adhesive since 2015. The concentration reported was 100 to 500 ppm. [Considered contaminant due to concentration below 500 ppm.]

Table C-1: Tier 2 Uses of TBBPA		
Use	**Expected Users**	**Description of Use or Process and References**
Textiles (clothing)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists the use of TBBPA as an ink/dye/pigment or manufacturing additive (to facilitate manufacturing process) in clothing available for consumer use, targeted for both children under 3 years of age and from 3 to 12 years of age. Clothing includes dresses, full body wear, jackets, overalls/body suits, pants/briefs/undershorts, shirts/blouses/polo shirts/t-shirts, skirts, sportswear, and upper body wear. The concentrations reported were less than 100 ppm. [Considered contaminant due to concentration below 500 ppm.]
Textiles (clothing) [as a catalyst in]	Consumer	Washington State Dept. of Ecology (2019) The Children Safe Product Act Reported Data lists the use of TBBPA **as a catalyst** in clothing (sleepwear) available for consumer use, targeted for both children from 3 to 12 years of age. The source identified only a single instance of a product using TBBPA as a catalyst, since 2015. The concentration reported was 100 to 500 ppm. The current use or availability of these products is unknown. This is the only source identified that lists use of TBBPA as a catalyst. [Considered contaminant due to concentration below 500 ppm.]
Plastic products (full body wear clothing)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists the use of TBBPA as a component of plastic resin or polymer process full body wear clothing (one instance, less than 100 ppm) [Considered contaminant due to concentration below 500 ppm.]
Baby Car/Booster Seats	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists one instance of the use of TBBPA (since 2015) as a flame retardant used in baby car/booster seats at a concentration of 100 to 500 ppm. [Considered contaminant due to concentration below 500 ppm.]
Clothing	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists 58 instances of the use of TBBPA (since 2015) as a flame retardant used in clothing. This includes overalls/bodysuits, pants/briefs/ undershorts, shirts/blouses/polo shirts/t-shirts, skirts, and sportswear, all at concentrations less than 100 ppm; and headwear and socks at a concentration of 100 to 500 ppm. [Considered contaminant due to concentration below 500 ppm.]
Toys and Games	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists seven instances of the use of TBBPA (since 2015) as a flame retardant used in “other” toys and games (100 to 500 ppm). [Considered contaminant due to concentration below 500 ppm.]

Table C-1: Tier 2 Uses of TBBPA		
Use	**Expected Users**	**Description of Use or Process and References**
Greeting Cards/Gift Wrap/Occasion Supplies	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists two instances of the use of TBBPA as a contaminant in occasion supplies for consumer use (100 to 500 ppm), targeted for children 3 to 12 years of age. [Considered contaminant due to concentration below 500 ppm.]
Metal Jewelry	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists four instances of the use of TBBPA as a contaminant in jewelry targeted for children 3 to 12 years of age. These included brooches, earrings/body piercing jewelry and tiaras at a concentration of 100 to 500 ppm, and rings at less than 100 ppm. [Considered contaminant due to concentration below 500 ppm.]
Musical toys	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists one instance of the use of TBBPA as a contaminant in the surface coating (paints, waterproofing, etc.) of musical toys targeted for children 3 to 12 years of age (1,000 to 5,000 ppm). [Considered contaminant due to concentration below 500 ppm.]
Personal accessory variety packs (synthetic polymers)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists two instances of the use of TBBPA as a contaminant in the synthetic polymers in personal accessories targeted for both children under 3 and children 3 to 12 years of age (500 to 1,000 ppm). [Considered contaminant due to concentration below 500 ppm.]
Textiles (clothing)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists four instances of the use of TBBPA as a contaminant in clothing available for consumer use, targeted for both children under 3 years of age and from 3 to 12 years of age. Clothing includes full body wear (less than 100 ppm); headwear (500 to 1,000 ppm), socks (100 to 500 ppm). The current use or availability of these products is unknown. [Considered contaminant due to concentration below 500 ppm.]
Textiles (toys)	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists one incident of the use of TBBPA as a contaminant in textiles in toy/games variety packs targeted for children 3 to 12 years of age (500 to 1,000 ppm). [Considered contaminant due to concentration below 500 ppm.]

Table C-1: Tier 2 Uses of TBBPA		
Use	**Expected Users**	**Description of Use or Process and References**
Toys/Games	Consumer	Washington State Dept. of Ecology 2019 The Children Safe Product Act Reported Data lists twelve instances of the use of TBBPA as a contaminant in the synthetic polymers of toys and games targeted for both children under 3 and 3 to 12 years of age. These include action figures (100 to 500 ppm); powered car/train sets (500 to 1,000 ppm); non-ride vehicles (100 to 500 ppm); powered ride-on vehicles (less than 100 ppm); powered viewing toys, variety packs and "other" toys and games (100 to 500 ppm). [Considered contaminant due to concentration below 500 ppm.]