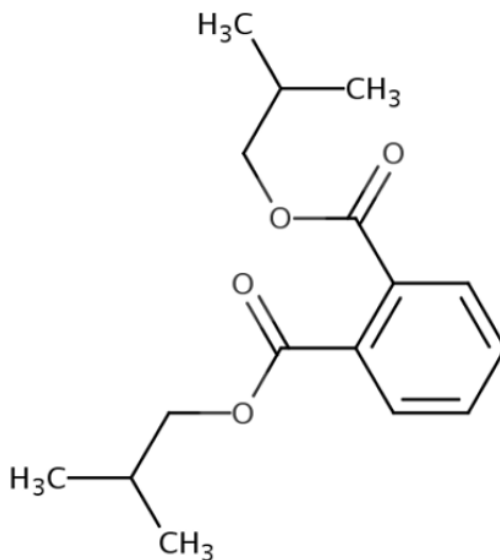




United States
Environmental Protection Agency

Draft Risk Evaluation for Diisobutyl Phthalate (DIBP)

CASRN 84-69-5



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Docket

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EXECUTIVE SUMMARY

Background

EPA evaluated the chemical diisobutyl phthalate (DIBP) under the Toxic Substances Control Act (TSCA). In this draft risk evaluation, the Agency preliminarily determined that DIBP presents an unreasonable risk of injury to health and the environment driven by identified risk to workers under two conditions of use (COUs) and identified risk to the environment under four COUs based on chronic exposure to vertebrates from DIBP releases to surface water. Of the 28 COUs EPA evaluated, 22 were preliminarily determined to not contribute to unreasonable risk of DIBP to human health or the environment. The Agency did not identify risk of injury to consumers or the general population associated with any COU that would drive the unreasonable risk determination for DIBP.

In December 2019, EPA designated DIBP as a high-priority substance for TSCA risk evaluation and in August 2020 released the final scope of the risk evaluation ([U.S. EPA, 2020c](#)). This draft risk evaluation assesses human health risk to workers, including occupational non-users (ONUs), consumers, and the general population exposed to DIBP from environmental releases. It also assesses risk to the environment. Manufacturers report DIBP production volumes through the Chemical Data Reporting (CDR) rule under the associated CAS Registry Number (CASRN) 84-69-5. The production volume for DIBP was approximately 400,000 pounds (lb) in 2019 based on the 2020 CDR data. The Agency has evaluated DIBP across its COUs, ranging from manufacture to disposal.

DIBP is used primarily as a plasticizer in polyvinyl chloride (PVC) in consumer, commercial, and industrial applications (Section 1.1.2). It is also used as a stabilizing agent in the manufacturing of adhesives, paint, coatings, rubbers, and non-PVC plastic products. Workers may be exposed to DIBP when making these products or otherwise using DIBP in the workplace (Section 4.1.1). When it is manufactured or used to make products, DIBP can be released into water, where because of its physical and chemical properties, most will end up in the sediment at the bottom of lakes and rivers (Section 3.3.1.1). If released into the air (Section 3.3.1.2), DIBP will attach to dust particles and be deposited on land or into water. Indoors, DIBP has the potential over time to be released from products and adhere to dust particles (Section 4.1.2). If it does, people could inhale or ingest dust that contains DIBP.

Laboratory animal studies have been conducted to determine whether exposure to DIBP can cause a range of non-cancer health effects in people. After reviewing the reasonably available studies, EPA concludes that there is strong evidence that DIBP causes developmental toxicity (a non-cancer hazard). The most sensitive adverse developmental effects include effects on the developing male reproductive system, based on studies in rodents, consistent with a disruption of androgen action—what is known as “phthalate syndrome.”

EPA included DIBP in a cumulative risk assessment (CRA) along with five other phthalates¹ that can cause effects on laboratory animals consistent with phthalate syndrome, as described in the *Revised Draft Technical Support Document for Cumulative Risk Analysis* ([U.S. EPA, 2025ad, 2023c](#)). Assessments by Health Canada, U.S. Consumer Product Safety Commission (U.S. CPSC), European Chemicals Agency (ECHA), and the Australian National Industrial Chemicals Notification and Assessment Scheme (NICNAS) have reached similar conclusions regarding the developmental effects of DIBP. Those agencies also conducted CRAs of phthalates based on their shared ability to cause phthalate syndrome. Furthermore, independent, expert peer reviewers supported EPA’s proposal to conduct a CRA of multiple phthalates under TSCA during the May 2023 meeting of the Science

¹ Di(2-ethylhexyl) phthalate (DEHP), dibutyl phthalate (DBP), butyl benzyl phthalate (BBP), dicyclohexyl phthalate (DCHP), and diisononyl phthalate (DINP).

Advisory Committee on Chemicals ([SACC](#)) because humans are co-exposed to multiple toxicologically similar phthalates that can cause effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome.

In this draft risk evaluation, the Agency addressed cumulative exposure to phthalates using human biomonitoring data. Note that these cumulative phthalate exposures cannot be attributed to specific COUs or other sources under TSCA. This non-attributable, cumulative exposure and risk, representing the national population, was taken into consideration by EPA in its draft risk evaluation for DIBP. By taking into account cumulative risk as other authoritative bodies have done, the Agency is confident that it is not underestimating the risk of DIBP. The CRA also considers differences in the ability of each phthalate to cause effects on the developing male reproductive system. Use of this “relative potency” provides a more robust risk assessment of DIBP as well as a common basis for adding risk across the six phthalates—DEHP, DBP, BBP, DCHP, DINP, and DIBP—included in the (revised) CRA.

Past assessments of DIBP from other government agencies that addressed a broad range of uses, which may have included TSCA and “non-TSCA” uses, have concluded that DIBP alone or in combination with exposure to other phthalate chemicals may pose a hazard and/or risk to human health based on its concentration in products and the environment. Notably, both the U.S. CPSC’s and Health Canada’s risk assessments included consideration of exposure from children’s products as well as from other sources such as personal care products, diet, consumer products, and the environment, but did not specifically consider DIBP exposure to workers. In this draft risk evaluation, EPA preliminarily identified risks to workers in the case of manufacturing and some of the processing and uses of DIBP. However, DIBP does not contribute to unreasonable risk to consumers or the general population under any COU.

In this draft risk evaluation, EPA evaluated whether manufacturing, processing, distribution in commerce, use, or disposal of DIBP presents unreasonable risk to human health or the environment under COUs subject to TSCA. Human or environmental exposure to DIBP through uses that are not subject to TSCA (*e.g.*, use in cosmetics, medical devices, food contact materials) were not evaluated by the Agency in reaching its preliminary determination of unreasonable risk to human health because these uses are excluded from TSCA’s definition of chemical substance. Thus, although EPA is preliminarily determining in this draft risk evaluation that six specific COUs significantly contribute to its draft unreasonable risk determination for DIBP, this determination cannot be extrapolated to form conclusions about uses of DIBP that are not subject to TSCA and that the Agency did not evaluate.

Determining Unreasonable Risk to Human Health

EPA’s TSCA existing chemicals risk evaluations must determine whether a chemical substance does or does not present unreasonable risk to human health or the environment under its COUs. The unreasonable risk determination must be informed by the best available science. The Agency, in making the finding of *presents unreasonable risk to human health and the environment*, considers risk-related factors as described in its [2024 risk evaluation framework rule](#) and required under TSCA ([U.S. EPA, 2024j](#)). Risk-related factors beyond the levels of DIBP that can impact an unreasonable risk finding include, but are not limited to, the type of health effects under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), population exposed (including any potentially exposed or susceptible subpopulations [PESS]), and EPA’s confidence in the information used to inform the hazard and exposure values. These considerations are included as part of a pragmatic and holistic evaluation of hazard and exposure to DIBP. If an estimate of risk for a specific scenario exceeds the standard risk benchmarks, then determination of whether those risks significantly contribute to the unreasonable risk of DIBP under TSCA is both case-by-case and context-driven. EPA considers all the aforementioned risk-related

factors when making a determination of whether a COU significantly contributes to unreasonable risk under TSCA.

EPA evaluated the risks to people from being exposed to DIBP at work, indoors, and outdoors. In its human health evaluation, the Agency used a combination of screening level and more refined approaches to assess exposure to DIBP through breathing or ingesting dust or other particulates as well as through skin contact. Risks are characterized for occupational and consumer exposures to DIBP—alone as well as in combination with the measured cumulative phthalate exposure that is experienced by the U.S. population and that cannot be attributed to a specific COU as part of the (revised) CRA.

In determining whether DIBP presents an unreasonable risk of injury to human health, EPA considered the following PESS in its assessment (Section 4.3.5): females of reproductive age, pregnant women, infants, children and adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, people living in proximity to releasing facilities (“fenceline” communities), and Tribes and subsistence fishers whose diets include large amounts of fish. These subpopulations are PESS because some have greater exposure to DIBP per body weight (*e.g.*, infants, children, adolescents) while others may experience exposure from multiple sources or higher exposures than others. EPA’s robust screening analysis preliminarily finds that exposure of consumers and the general population to DIBP does not contribute to unreasonable risk of injury to human health (Sections 6.1.5 and 6.1.6, respectively). However, the Agency preliminarily identified two COUs where occupational exposure for workers significantly contributes to the unreasonable risk of injury to human health.

Determining Unreasonable Risk to the Environment

In determining whether DIBP presents an unreasonable risk of injury to the environment, EPA considered the following groups of organisms in its assessment: aquatic vertebrates, aquatic invertebrates, benthic invertebrates, aquatic plants and algae, terrestrial mammals, soil invertebrates, and terrestrial plants. The Agency weighed the scientific evidence in order to determine confidence levels in underlying datasets and risk estimates for the environment (Section 5.3). EPA has moderate to robust confidence in its environmental data and risk estimates depending on the source of environmental release information for each COU (Section 5.3.4). The Agency has preliminarily determined that DIBP presents unreasonable risk of injury to the environment based on four COUs due to chronic exposure to aquatic vertebrates based on DIBP releases to surface water.

Conclusions

EPA has preliminarily determined that of the 28 COUs evaluated, 2 significantly contribute to the unreasonable risk to human health due to inhalation exposure to DIBP for workers and 4 significantly contribute to risk to unreasonable risk to the environment due to chronic exposure to aquatic vertebrates by DIBP in surface water. For consumers and for the general population, the Agency has preliminarily determined that no COUs contribute to unreasonable risk.

EPA is preliminarily determining the following two COUs significantly contribute to unreasonable risk of DIBP to workers due to inhalation exposure:

- Industrial use – adhesives and sealants – two-component glues and adhesives; transportation equipment manufacturing (inhalation exposure for workers from spray applications); and
- Commercial use – adhesives and sealants – two-component glues and adhesives (inhalation exposure for workers from spray applications).

EPA is preliminarily determining that the following four COUs significantly contribute to unreasonable risk of DIBP to the environment due to chronic exposure to aquatic vertebrates based on DIBP releases to surface water:

- Processing – incorporation into formulation, mixture, or reaction product – plasticizer (plastic product manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paints and coatings);
- Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and
- Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production).

EPA is preliminarily determining that the following 22 COUs do *not* significantly contribute to unreasonable risk:

- Manufacturing – domestic manufacturing;
- Manufacturing – import;
- Processing – incorporation into formulation, mixture, or reaction product – plastic and rubber products not covered elsewhere;
- Processing – as a reactant – intermediate (plastic manufacturing);
- Processing – repackaging – repackaging (*e.g.*, laboratory chemicals);
- Processing – incorporation into article – plasticizer (plastic product manufacturing; transportation equipment manufacturing);
- Processing – recycling;
- Distribution in commerce;
- Industrial use – foam – pipeline pigs;
- Industrial use – paints and coatings – paints and coatings;
- Industrial use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial use – toys, playground, and sporting equipment;
- Commercial use – paints and coatings – paints and coatings;
- Commercial use – laboratory chemicals – laboratory chemicals;
- Consumer use – adhesives and sealants – adhesives and sealants;
- Consumer use – fabric, textile, and leather products not covered elsewhere;
- Consumer use – floor coverings – floor coverings;
- Consumer use – toys, playground, and sporting equipment – toys, playground, and sporting equipment;
- Consumer use – paints and coatings – paints and coatings;
- Consumer use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); and
- Disposal.

Next Steps and Public Input

This draft risk evaluation has been released for public comment. EPA seeks public comment on all aspects of this draft risk evaluation. In particular, the Agency seeks comment on the following:

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1. whether and how exposure controls and personal protective equipment (PPE) are used during the manufacture, processing, and use of DIBP for each of the COUs;
2. information that could be used to refine upper-bound or screening level assumptions for DIBP, particularly for the COUs that may significantly contribute to unreasonable risk;
3. information on inhalation occupational exposure to DIBP under the COUs, including monitoring or personal breathing zone data and exposure to respirable particles (*i.e.*, data on particle formation or size);
4. input on the dermal occupational exposure scenarios used to assess DIBP, including the use of a flux-limited approach to estimate dermal absorption and any supporting data to inform assumptions regarding duration and surface area of exposure;
5. information to inform the assessment of dermal and inhalation exposures to DIBP for ONUs;
6. information on the extent to which spray applications of DIBP are used in industrial and commercial COUs and the volumes of DIBP that may be used;
7. information on environmental releases of DIBP, including media of environmental release (*i.e.*, air, land, water, or incineration), facility-specific receiving water bodies, and the use of wastewater treatment information to inform exposures of ONUs in the assessment;
8. approaches used to estimate chemical migration rate for ingestion of DIBP via mouthing in the consumer exposure assessments;
9. integration of the cumulative risk assessment approach within DIBP risk evaluation, derivation of relative potency factors (RPFs), and individual DIBP point of departures (PODs);
10. selection of human health and environmental hazard endpoints used in the DIBP risk characterization;
11. any other information that may inform the assumptions used for exposure modeling used to assess the COUs for DIBP.

In addition to the draft technical support documents (TSDs; see Appendix C) for the human health and environmental hazard assessments for DIBP, the SACC will peer review separate draft risk evaluations for diethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), and dicyclohexyl phthalate (DCHP) during its August 2025 meeting. Recommendations from the SACC, as well as public comments on the draft risk evaluations for DEHP, DBP, and DCHP as well as the draft hazard assessments for DIBP will inform the final risk evaluation of DIBP—including the Agency determination of whether DIBP presents unreasonable risk to human health or the environment under the COUs. If in the final risk evaluation, the Agency determines that DIBP presents unreasonable risk to human health or the environment, EPA will initiate regulatory action so that DIBP no longer presents such risk.

1 INTRODUCTION

EPA has evaluated diisobutyl phthalate (DIBP) under section 6(b) of the Toxic Substances Control Act (TSCA). DIBP is primarily used as a plasticizer in polyvinyl chloride (PVC) in consumer, commercial, and industrial applications—although it is also used in adhesives, sealants, paints, coatings, rubbers, and non-PVC plastics as well as for other applications. Section 1.1 summarizes the scope of this draft DIBP risk evaluation and provides information on production volume, a life cycle diagram (LCD), TSCA conditions of use (COUs), and conceptual models used for DIBP. Section 1.2 presents the organization of this risk evaluation.

Figure 1-1 provides an overview of the major inputs, phases/components, and outputs of the [TSCA risk evaluation process](#), from chemical prioritization to scoping to releasing the final risk evaluation.

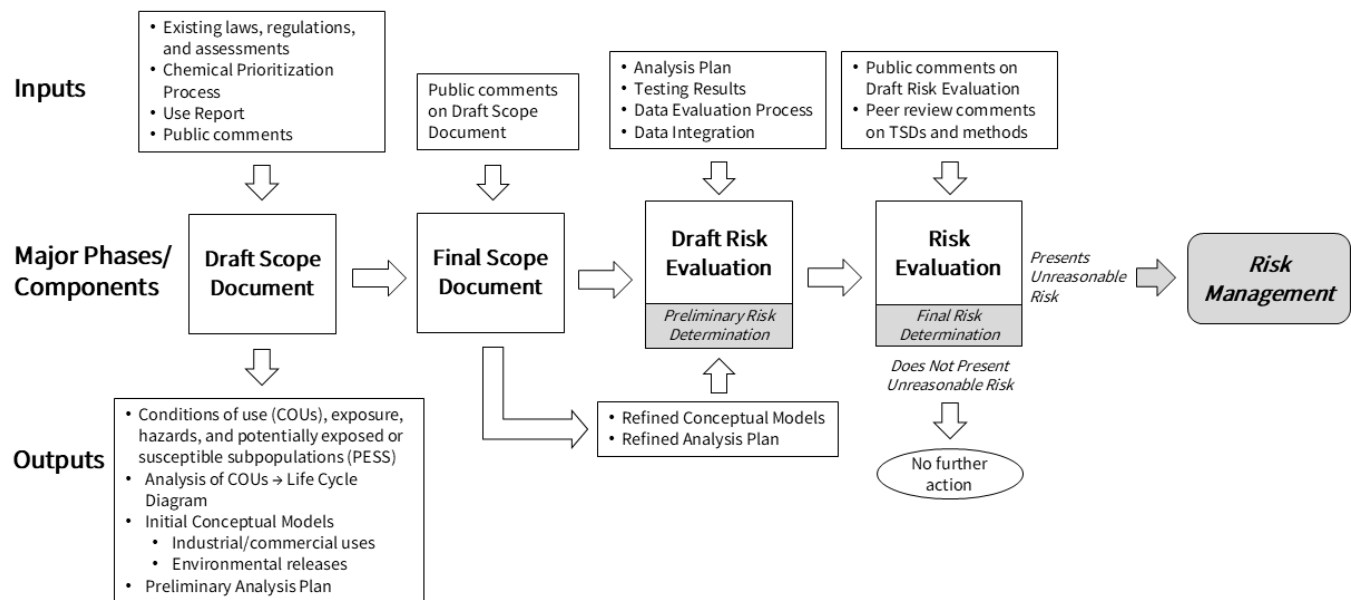


Figure 1-1. Overview of TSCA Existing Chemical Risk Evaluation Process

1.1 Scope of the Risk Evaluation

EPA evaluated risk to human health and the environment for DIBP. Specifically for human populations, the Agency evaluated risk to workers and occupational non-users (ONUs) via inhalation routes; risk to workers via dermal routes; risk to ONUs via dermal routes for occupational exposure scenarios (OESs) that involve mists and dusts; risk to consumers via inhalation, dermal, and oral routes; and risk to bystanders via the inhalation route. Additionally, EPA considered the following potentially exposed or susceptible populations (PESS) in its assessment: females of reproductive age, pregnant women, infants, children and adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, and Tribes and subsistence fishers whose diets include large amounts of fish. As described further in Section 4.1.3, EPA assessed risks to the general population, including considerations for fenceline populations, from environmental releases using a screening level analysis that considered risk from exposure to DIBP via oral ingestion of surface water, drinking water, fish, and soil from air to soil deposition. For environmental populations, the Agency evaluated risk to aquatic species via water, sediment, and air as well as risk to terrestrial species via air, soil, sediment, and water.

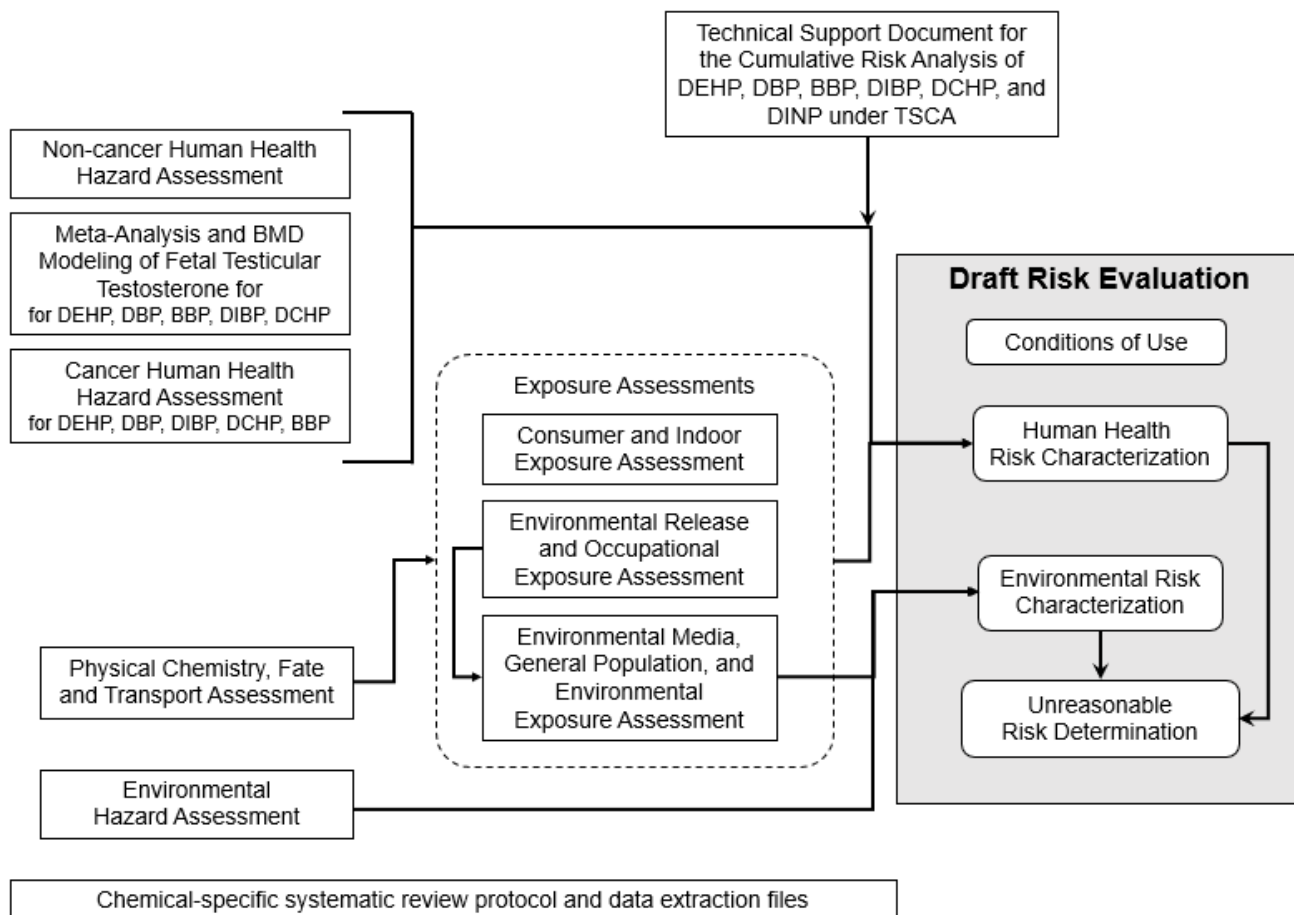
Consistent with EPA's *Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* ([U.S. EPA, 2023c](#)), EPA also released a draft cumulative risk technical support document (TSD) of DIBP and five other toxicologically similar phthalates: diethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), dicyclohexyl phthalate (DCHP), butyl benzyl phthalate (BBP), and diisononyl phthalate (DINP). These phthalates are also being evaluated under TSCA based on a common toxicological endpoint ("phthalate syndrome," which results from decreased fetal testicular testosterone) ([U.S. EPA, 2025ad](#)). The cumulative risk analysis takes into consideration differences in phthalate potency to cause effects on the developing male reproductive system. Use of relative potency across the phthalates provides a more robust risk assessment of DIBP and a common basis for adding risk across the cumulative phthalates.

Numerous other regulatory agencies—Health Canada, U.S. Consumer Product Safety Commission (U.S. CPSC), European Chemicals Agency (ECHA), and the Australian National Industrial Chemicals Notification and Assessment Scheme (NICNAS)—have assessed phthalates for cumulative risk, and EPA's proposal to conduct a CRA of phthalates under TSCA was supported by the Science Advisory Committee on Chemicals (SACC). As described further in Sections 4.4.4, cumulative risk considerations focus on acute duration exposures to the most susceptible subpopulations: female workers and consumers of reproductive age (16–49 years) as well as male infants and male children (3–15 years) exposed to consumer products and articles.

This draft DIBP risk evaluation includes a series of TSDs, each of which contains sub-assessments that inform adjacent, "downstream" TSDs and related supplemental documents and files. A basic diagram showing the layout and relationship of these assessments is provided below in Figure 1-2. High-level summaries of each relevant TSD are presented in this draft risk evaluation. Detailed information for each can be found in the corresponding documents. Appendix C includes a list and citations for all TSDs and supplemental documents and files included in this draft risk evaluation for DIBP.

These TSDs leveraged the data and information sources already identified in the *Final Scope of the Risk Evaluation for Di-isobutyl Phthalate (1,2-benzenedicarboxylic acid, 1,2-bis(2-methylpropyl) ester)*; CASRN 84-69-5 (also referred to as the "final scope document" or "final scope") ([U.S. EPA, 2020c](#)). OPPT conducted a comprehensive search for "reasonably available information" to identify relevant DIBP data for use in the draft risk evaluation. The approach used to identify specific relevant risk assessment information was discipline-specific and is detailed in *Draft Systematic Review Protocol for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025ac](#)), or as otherwise noted in the relevant TSDs and supplemental documents and files.

592



593 **Figure 1-2. Draft Risk Evaluation Document Summary Map**

594 1.1.1 Life Cycle and Production Volume

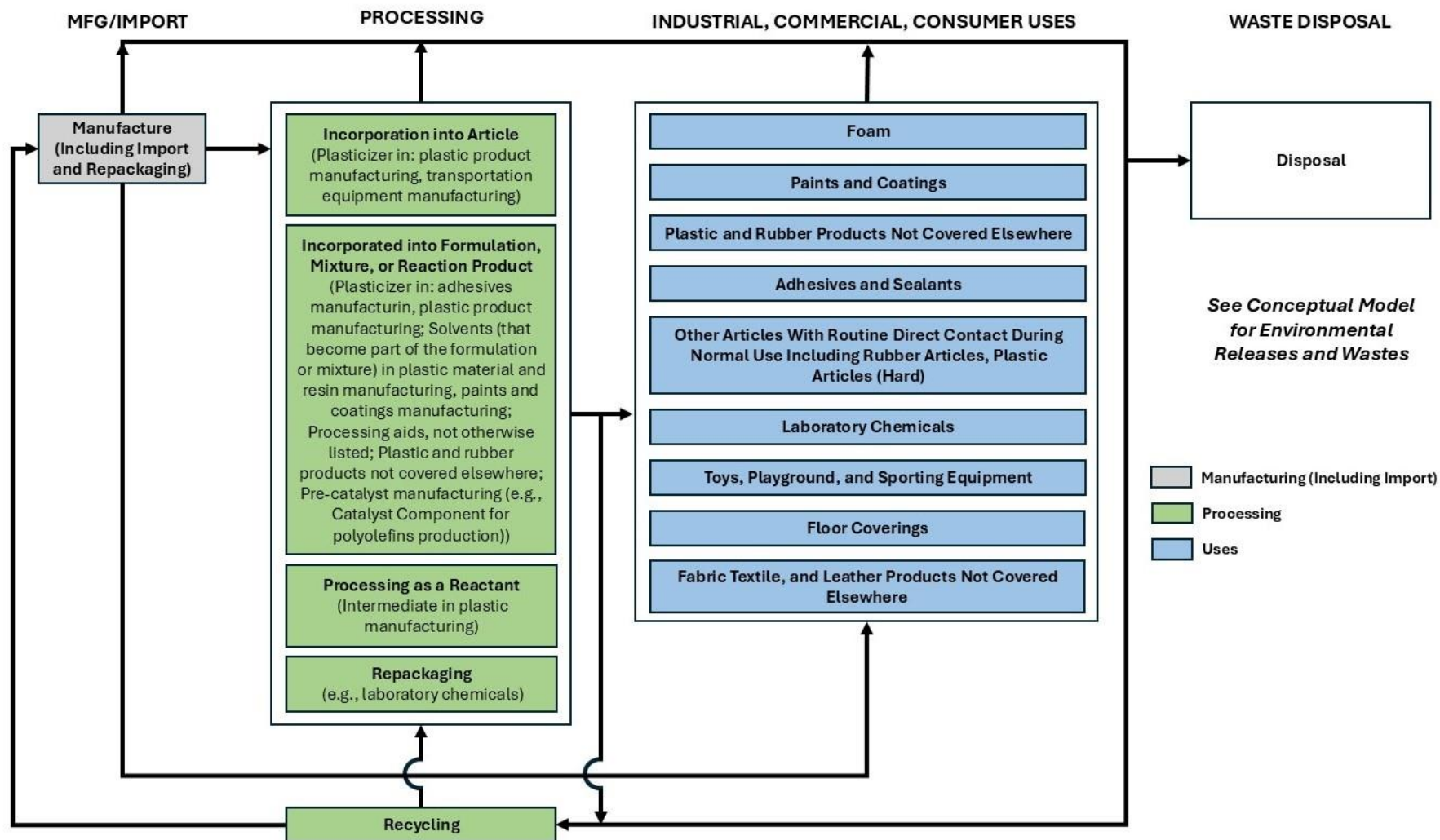
595 The LCD shown in Figure 1-3 depicts the COUs that are within the scope of the draft risk evaluation
 596 during various life cycle stages, including manufacturing, processing, distribution, use (industrial,
 597 commercial, consumer), and disposal. The LCD has been updated since its inclusion in the final scope
 598 document, with consolidated and/or expanded processing and use steps. A complete list of updates and
 599 descriptions of the updates made to COUs for DIBP from the final scope document to this draft risk
 600 evaluation is provided in Appendix D. Information in the LCD is grouped according to the Chemical
 601 Data Reporting (CDR) processing codes and use categories (including functional use codes for industrial
 602 uses and product categories for industrial and commercial uses). The CDR rule under TSCA section 8(a)
 603 (see 40 CFR part 711) requires certain U.S. manufacturers (including importers) to provide EPA with
 604 information on the chemicals they manufacture or import into the United States. The Agency collects
 605 CDR data approximately every 4 years with the latest collections available occurring in 2006, 2012,
 606 2016, and 2020.

607
 608 EPA included descriptions of the industrial, commercial, and consumer use categories identified from
 609 the 2020 CDR in the LCD (Figure 1-3) ([U.S. EPA, 2020a](#)). The descriptions provide a brief overview of
 610 the use category; the *Draft Environmental Release and Occupational Exposure Assessment for*
 611 *Diisobutyl Phthalate* ([U.S. EPA, 2025t](#)) contains more detailed descriptions (e.g., process descriptions,
 612 worker activities, process flow diagrams, equipment illustrations) for each manufacturing, processing,
 613 use, and disposal category.

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614 Based on the 2020 CDR data, the U.S. production volume for DIBP was 407,303 lb in 2019, 403,833 lb
615 in 2018, 384,591 lb in 2017, and 440,833 lb in 2016, as reported by the singular site Lanxess
616 Corporation in Pittsburgh, Pennsylvania. For the 2016 and 2020 CDR cycle, data collected per chemical
617 included the company name, volume of each chemical manufactured/imported, and information on
618 whether the chemical is used in the commercial, industrial, and/or consumer sector(s).

619



620

621 **Figure 1-3. DIBP Life Cycle Diagram**

622 See Table 1-1 for categories and subcategories of COUs. Activities related to distribution will be considered throughout the DIBP life cycle, as well as
623 qualitatively through a single distribution scenario.

1.1.2 Conditions of Use Included in the Draft Risk Evaluation

The final scope document ([U.S. EPA, 2020c](#)) identified and described the life cycle stages, categories, and subcategories that comprise COUs that EPA planned to consider in the risk evaluation. All COUs for DIBP included in this draft risk evaluation are reflected in the LCD (see Figure 1-3) and conceptual models (Section 1.1.2.1). Table 1-1 below lists all COUs for DIBP.

In this draft risk evaluation, EPA made updates to the COUs listed in the final scope document ([U.S. EPA, 2020c](#)). A complete list of updates and explanations of the updates made to COUs for DIBP from the final scope document to this draft risk evaluation is provided in Appendix D.

Table 1-1. Categories and Subcategories of Use in the Draft Risk Evaluation for DIBP

Life Cycle Stage ^a	Category ^b	Subcategory ^c	Reference(s)
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2020a)
	Import	Import	U.S. EPA (2019)
Processing	Incorporation into article	Plasticizers (plastic product manufacturing; transportation equipment manufacturing)	U.S. EPA (2019) ; EPA-HQ-OPPT-2019-0131-0022 ; EPA-HQ-OPPT-2018-0434-0014 ; EPA-HQ-OPPT-2018-0434-0007
	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers (adhesive manufacturing; plastic product manufacturing)	U.S. EPA (2019) ; EPA-HQ-OPPT-2018-0434-0014 ; EPA-HQ-OPPT-2018-0434-0007
	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paint and coating manufacturing)	(Aceto US LLC, 2022; LANXESS, 2021a; U.S. EPA, 2019a; LANXESS, 2015)
	Processing – incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed	(LANXESS, 2021a)
	Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	(U.S. EPA, 2019a; LANXESS, 2015)
	Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (e.g., catalyst component for polyolefins production)	(W.R. Grace & Co., 2024, 2022; LANXESS, 2021a)
	Processing – as a reactant	Intermediate (plastic manufacturing)	(W.R. Grace & Co., 2024; LANXESS, 2021a)
	Repackaging (e.g., laboratory chemicals)	Repackaging (e.g., laboratory chemicals)	EPA-HQ-OPPT-2018-0434-0020

Life Cycle Stage ^a	Category ^b	Subcategory ^c	Reference(s)
	Recycling	Recycling	EPA-HQ-OPPT-2018-0434-0014
Distribution in Commerce	Distribution in commerce	Distribution in commerce	N/A
Industrial Use	Foam	Pipeline pigs	(LANXESS, 2021a)
	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	U.S. EPA (2019); EPA-HQ-OPPT-2019-0131-0022
	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	U.S. EPA (2019); Azon USA Inc (2015); Chemical Concepts Inc. (2014); Glue 360 Inc (2018); EPA-HQ-OPPT-2018-0434-0007; EPA-HQ-OPPT-2019-0131-0022
Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives	U.S. EPA (2019); Azon USA Inc (2015); Chemical Concepts Inc. (2014); Glue 360 Inc (2018); EPA-HQ-OPPT-2018-0434-0007; EPA-HQ-OPPT-2019-0131-0022
	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	U.S. EPA (2020a); EPA-HQ-OPPT-2019-0131-0022
	Laboratory chemicals	Laboratory chemicals	Sigma Aldrich (2024)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	(U.S. EPA, 2019e, 2016a)
Consumer Use	Floor coverings	Floor coverings	EPA-HQ-OPPT-2018-0434-0014; Danish EPA, 7265437); (Danish EPA, 10622421)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	(U.S. EPA, 2019e, 2016a)
	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	(Dow Chemical, 2013)

Life Cycle Stage ^a	Category ^b	Subcategory ^c	Reference(s)
Consumer Use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	(U.S. EPA, 2019a , e, 2016a); EPA-HQ-OPPT-2019-0131-0022
	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019) ; Azon USA Inc (2015) ; Chemical Concepts Inc. (2014) Glue 360 Inc (2018) ; EPA-HQ-OPPT-2018-0434-0007 ; EPA-HQ-OPPT-2019-0131-0022 ; ITW Performance Polymers (2015)
Disposal	Disposal	Disposal	
^a Life Cycle Stage Use Definitions (40 CFR 711.3) – “Industrial use” means use at a site at which one or more chemicals or mixtures are manufactured (including imported) or processed. – “Commercial use” means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services. – “Consumer use” means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use. – Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over “any manner or method of commercial use” under TSCA section 6(a)(5) to reach both. ^b These categories of COU appear in the LCD, reflect CDR codes, and broadly represent COUs of DIBP in industrial and/or commercial settings. ^c These subcategories represent more specific activities within the life cycle stage and category of the COUs of DIBP.			

1.1.2.1 Conceptual Models

The conceptual model in Figure 1-4 presents the exposure pathways, exposure routes, and hazards to human populations from industrial and commercial activities and uses of DIBP. There is potential for exposure to workers and/or ONUs via inhalation and via dermal contact. The conceptual model also includes potential ONU dermal exposure to DIBP in mists and dusts deposited on surfaces. Figure 1-5 presents the conceptual model for consumer activities and uses, Figure 1-6 presents general population exposure pathways and hazards for environmental releases and wastes, and Figure 1-7 presents the conceptual model for ecological exposures and hazards from environmental releases and wastes.

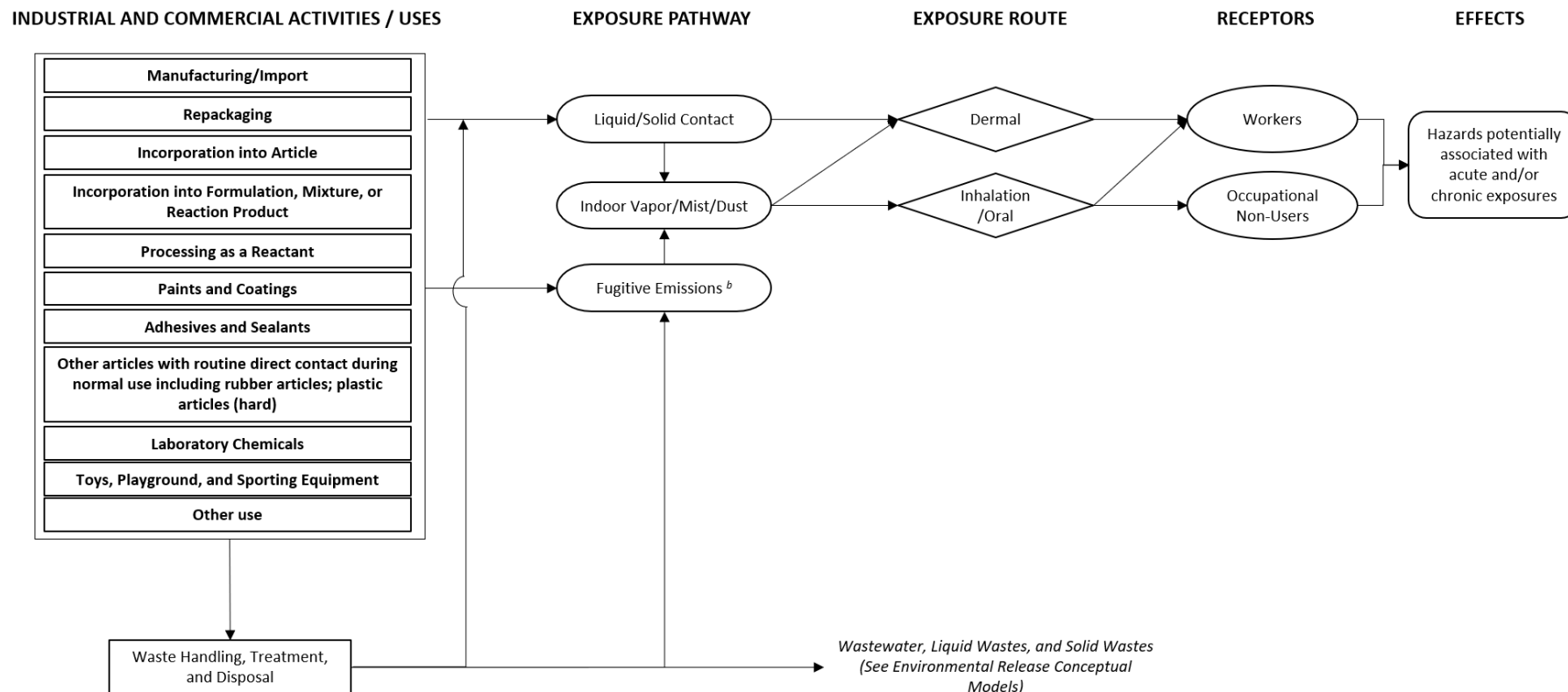


Figure 1-4. DIBP Conceptual Model for Industrial and Commercial Activities and Uses: Potential Exposures and Hazards

^a Some products are used in both commercial and consumer applications. See Table 1-1 for categories and subcategories of COUs.

^b Fugitive air emissions are those that are not stack emissions and include fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections and open-ended lines; evaporative losses from surface impoundment and spills; and releases from building ventilation systems.

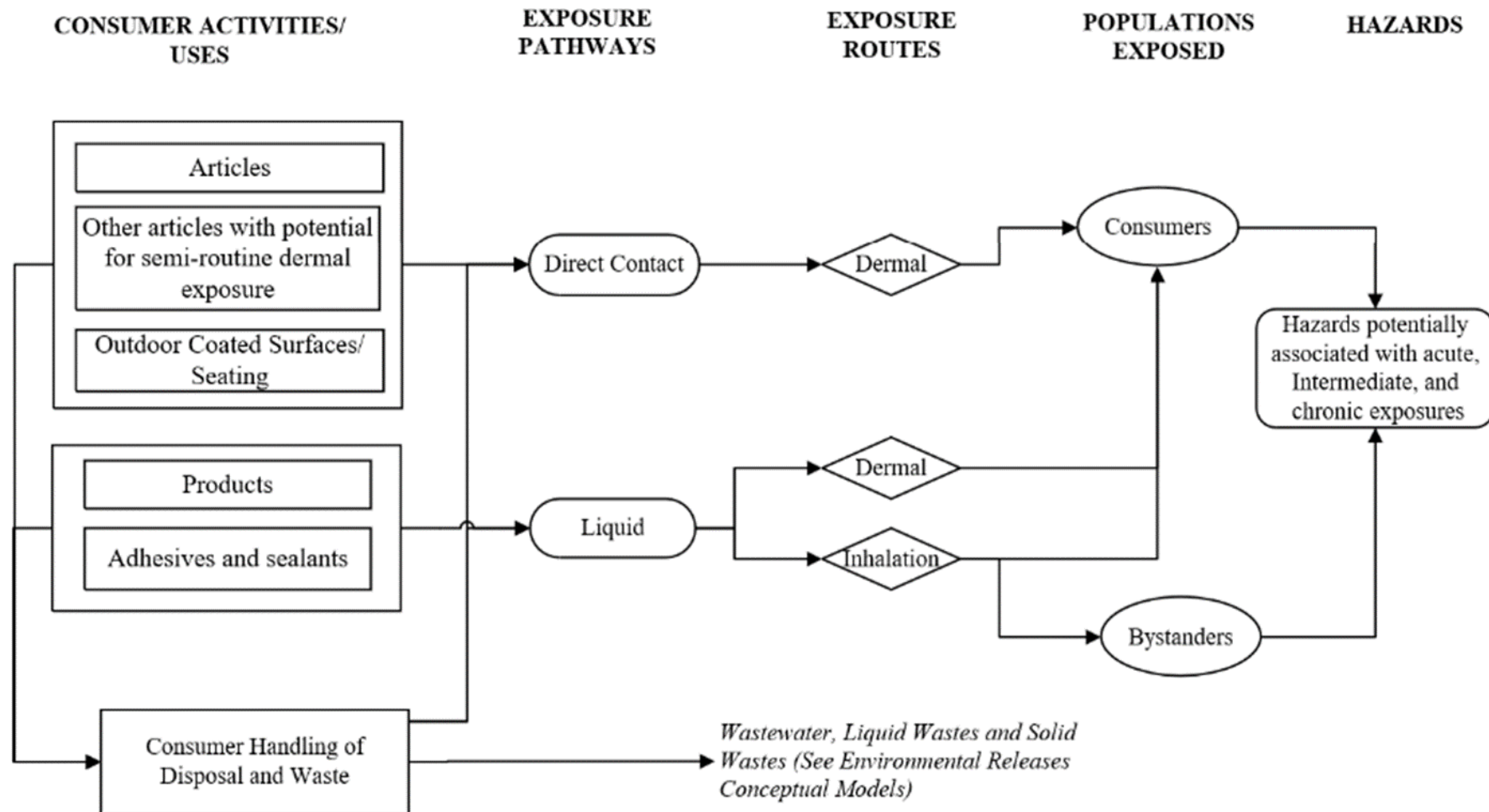


Figure 1-5 DIBP Conceptual Model for Consumer Activities and Uses: Potential Exposures and Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from consumer activities and uses of DIBP.

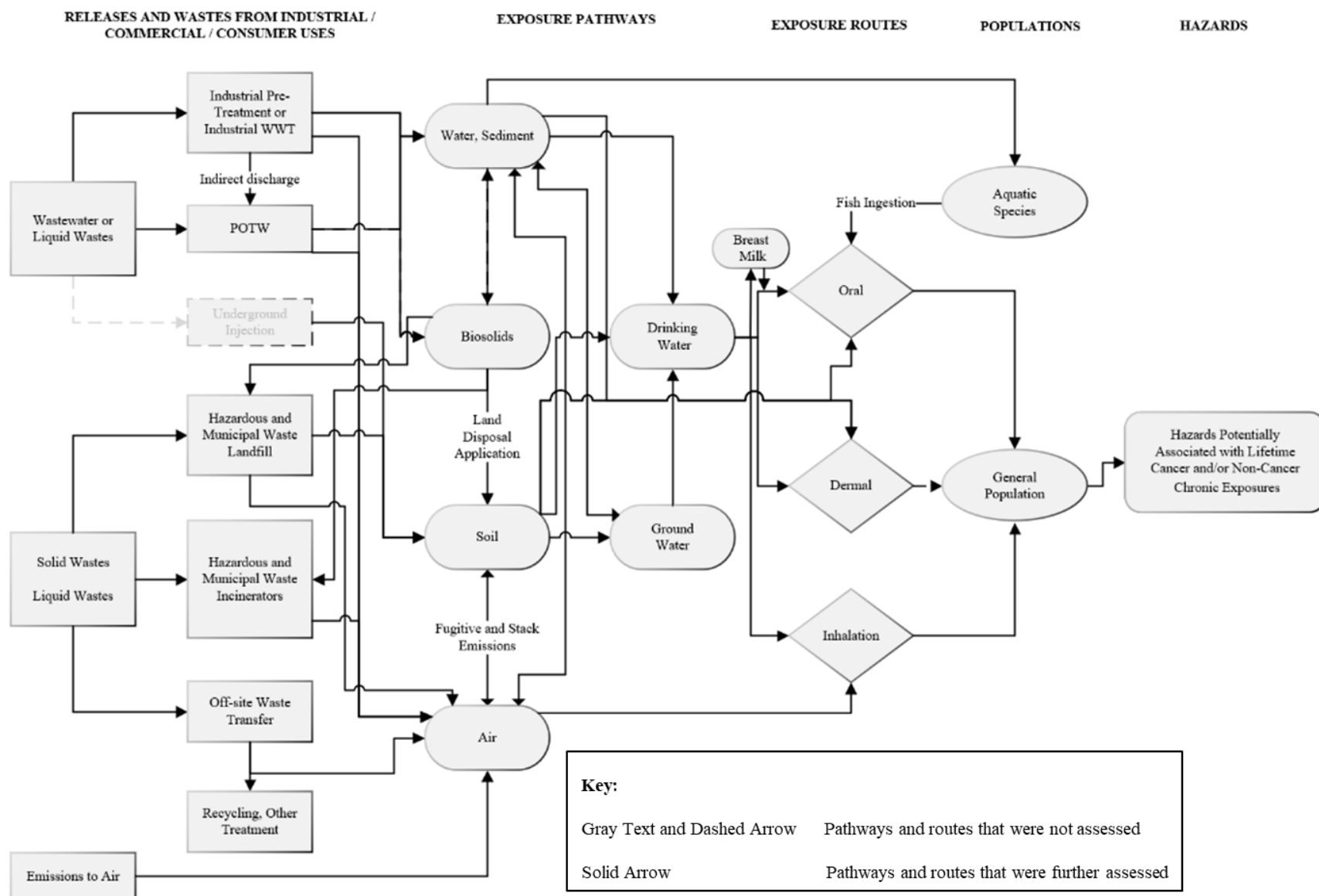


Figure 1-6. DIBP Conceptual Model for Environmental Releases and Wastes: General Population Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from releases and wastes from industrial, commercial, and/or consumer uses of DIBP.

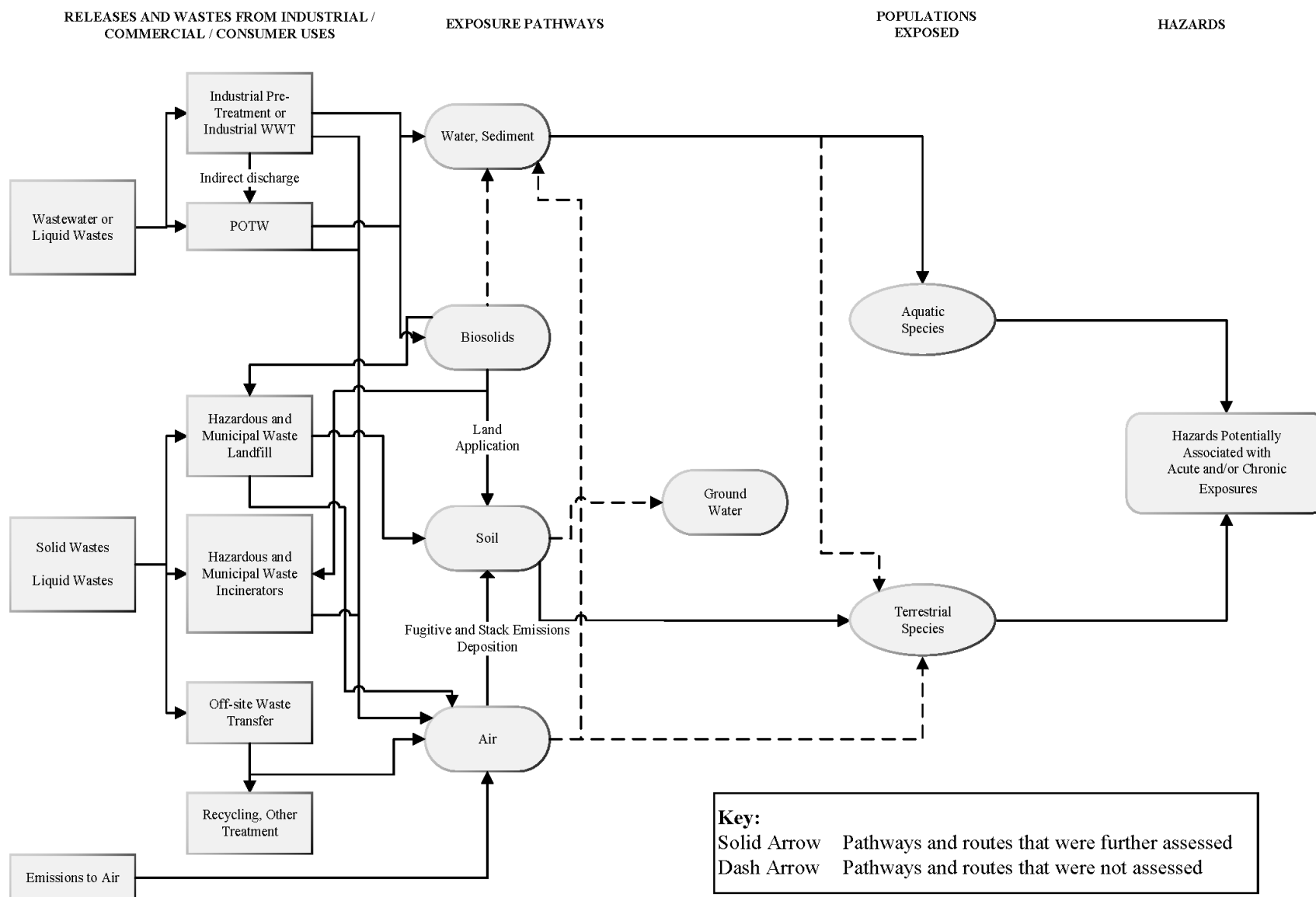


Figure 1-7. DIBP Conceptual Model for Environmental Releases and Wastes: Ecological Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to aquatic and terrestrial species from DIBP.

1.1.3 Populations and Durations of Exposure Assessed

Based on the conceptual models presented in Section 1.1.2.1, EPA evaluated risk to humans and the environment. Environmental risks were evaluated for acute and chronic exposure scenarios for aquatic and terrestrial species, as appropriate. Human health risks associated with exposure to DIBP were evaluated for acute, intermediate, and chronic exposure scenarios, as applicable based on reasonably available exposure and hazard data as well as the relevant populations for each. The following human populations were assessed:

- Workers, including average adults and females of reproductive age;
- ONUs, including average adults;
- Consumers, including infants (<1 year), toddlers (1–2 years), children (3–5 and 6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years);
- Bystanders to consumer uses, including infants (<1 year), toddlers (1–2 years), and children (3–5 and 6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years); and
- General population, including infants (<1 year), toddlers (1–5 years), children (6–10 years), youths (11–15 and 16–20 years), and adults (21+ years).

Note that the age groups for consumers, bystanders, and general population are different because each life stage used unique exposure factors (*e.g.*, mouthing, drinking water ingestion, fish consumption rates). These exposure factors are provided in EPA’s *Exposure Factors Handbook: 2011 Edition* ([U.S. EPA, 2011b](#)).

Consistent with its *Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* ([U.S. EPA, 2023c](#)), EPA is focusing its relative potency factor (RPF) analysis and phthalate CRA on populations most relevant to the common hazard endpoint (*i.e.*, reduced fetal testicular testosterone)—specifically females of reproductive age and male infants and male children. This approach emphasizes a common health effect for sensitive subpopulations; however, additional health endpoints are identified for broader populations and described in the individual non-cancer human health hazard assessments for DIBP ([U.S. EPA, 2025w](#)), DCHP ([U.S. EPA, 2024d](#)), DEHP ([U.S. EPA, 2024e](#)), DBP ([U.S. EPA, 2024c](#)), BBP ([U.S. EPA, 2025v](#)), and DINP ([U.S. EPA, 2024i](#)). Additionally, EPA is focusing its RPF and CRA on acute duration exposures. This is because—as described further in the *Revised Draft Technical Support Document for the CRA of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* ([U.S. EPA, 2025ad](#))—there is evidence that effects on the developing male reproductive system consistent with a disruption of androgen action can result from a single exposure during the critical window of development.

1.1.3.1 Potentially Exposed or Susceptible Subpopulations

TSCA section 6(b)(4)(A) requires that risk evaluations “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 PESS identified as relevant to the risk evaluation by the Administrator, under the conditions of use.” TSCA section 3(12) states that “the term ‘potentially exposed or susceptible subpopulation’ [PESS] means a group of individuals within the general population identified by the Administrator who, due to either greater susceptibility or greater exposure, may be at greater risk than the general population of adverse health effects from exposure to a chemical substance or mixture, such as infants, children, pregnant women, workers, or the elderly.”

This draft risk evaluation considers PESS throughout the human health risk assessment (Section 4), including throughout the exposure assessment, hazard identification, and dose-response analysis

supporting this assessment. EPA incorporated the following PESS into its assessment—females of reproductive age; pregnant women, infants, children and adolescents; people who frequently use consumer products and/or articles containing high-concentrations of DIBP; people exposed to DIBP in the workplace; and people who may be in proximity to releasing facilities, including fenceline communities, and people whose diets include large amounts of fish (*i.e.*, subsistence fisher and Tribal populations). These subpopulations are PESS because some have greater exposure to DIBP per body weight (*e.g.*, infants, children, adolescents), while some experience aggregate or sentinel exposures. EPA also evaluated non-attributable exposures and cumulative risk to phthalates (*i.e.*, DEHP, DBP, BBP, DIBP, and DINP) using biomonitoring data from the U.S. Centers for Disease and Control and Prevention (CDC’s) National Health and Nutrition Examination Survey (NHANES). This non-attributable cumulative risk from exposure to DEHP, DBP, BBP, DIBP, and DINP was taken into consideration as part of EPA’s cumulative risk calculations for DIBP, presented below in Sections 4.4.4 and 4.4.5 and around exposures to DIBP from both occupational and consumer COUs/OESs.

Section 4.3.5 summarizes how PESS were incorporated into the risk evaluation through consideration of potentially increased exposures and/or potentially increased biological susceptibility and summarizes additional sources of uncertainty related to consideration of PESS.

1.2 Organization of the Risk Evaluation

This draft risk evaluation for DIBP includes five additional major sections and several appendices, as listed below:

- Section 2 summarizes basic physical and chemical characteristics as well as the fate and transport of DIBP.
- Section 3 includes an overview of releases and concentrations of DIBP in the environment.
- Section 4 presents the human health risk assessment, including the exposure, hazard, and risk characterization based on the DIBP COUs. It includes a discussion of PESS based on both greater exposure and/or susceptibility as well as a description of aggregate and sentinel exposures. Section 4 also presents EPA’s CRA of DIBP, DEHP, DBP, BBP, DCHP, and DINP.
- Section 5 provides a discussion and analysis of the environmental risk assessment, including the environmental exposure, hazard, and risk characterization based on the COUs for DIBP. It also discusses assumptions and uncertainties and how they impact EPA’s overall confidence in risk estimates.
- Section 6 presents EPA’s proposed determination of whether the chemical presents an unreasonable risk to human health or the environment under the assessed COUs.
- Appendix A provides a list of key abbreviations and acronyms used throughout this draft risk evaluation.
- Appendix B provides a brief summary of the federal, state, and international regulatory history of DIBP.
- Appendix C includes a list and citations for all TSDs and supplemental documents and files included in the draft risk evaluation for DIBP.
- Appendix D provides a summary of updates made to COUs for DIBP from the final scope document to this draft risk evaluation.
- Appendix E provides descriptions of the DIBP COUs evaluated by EPA.
- Appendix F provides the draft occupational exposure value for DIBP derived by EPA.

2 CHEMISTRY AND FATE AND TRANSPORT OF DIBP

Physical and chemical properties determine the behavior and characteristics of a chemical that inform its COUs, environmental fate and transport, potential toxicity, exposure pathways, routes, and hazards. Environmental fate and transport includes environmental partitioning, accumulation, degradation, and transformation processes. Environmental transport is the movement of the chemical within and between environmental media such as air, water, soil, and sediment. Thus, understanding the environmental fate of DIBP informs the specific exposure pathways, and potential human and environmental exposed populations that EPA considered in this risk evaluation.

In general, under normal environmental conditions DIBP is a water-soluble clear viscous liquid that (1) is slightly volatile from water, (2) has low bioaccumulation potential in aquatic and terrestrial organisms, (3) has no apparent biomagnification across trophic levels in aquatic food webs, and (4) is considered readily biodegradable under most aquatic and terrestrial environmental conditions. Sections 2.1 and 2.2 summarize the physical and chemical properties, and environmental fate and transport of DIBP, respectively. EPA's *Draft Physical Chemistry and Fate and Transport Assessment Technical Support Document (TSD) for DIBP* ([U.S. EPA, 2025z](#)) provides further details.

2.1 Summary of Physical and Chemical Properties

EPA gathered and evaluated physical and chemical property data and information according to the process described in the *Draft Risk Evaluation for Diisobutyl Phthalate (DIBP) – Systematic Review Protocol* ([U.S. EPA, 2025ac](#)). EPA considered both measured and estimated physical and chemical property data/information summarized in Table 2-1, as applicable. Information on the full, extracted dataset is available in the *Draft Risk Evaluation for Diisobutyl Phthalate (DIBP) – Systematic Review Supplemental File: Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties* ([U.S. EPA, 2025l](#)).

Table 2-1. Physical and Chemical Properties of DIBP

Property	Selected Value(s)	Source	Data Quality Rating
Molecular formula	C ₁₆ H ₂₂ O ₄		
Molecular weight	278.35 g/mol		
Physical form	Clear viscous liquid	CPSC (2011)	High
Melting point	–64 °C	NLM (2013)	High
Boiling point	296.5 °C	NLM (2013)	High
Density	1.049 g/cm ³	Rumble (2018a)	High
Vapor pressure	4.76E–05 mmHg	NLM (2013)	High
Vapor density	9.59	NCBI (2020)	High
Water solubility	6.2 mg/L	U.S. EPA (2019b)	High
Octanol:water partition coefficient (log K _{ow})	4.34	Ishak et al. (2016)	High
Octanol:air partition coefficient (log K _{OA})	9.47 (EPI Suite™)	U.S. EPA (2017a)	High
Henry's Law constant	1.83E–07 atm·m ³ /mol at 25 °C	Elsevier (2019)	High
Flash point	185 °C	Rumble (2018b)	High
Autoflammability	432 °C	NLM (2013)	High
Viscosity	41 cP at 20 °C	NLM (2013)	High

2.2 Summary of Environmental Fate and Transport

Reasonably available environmental fate data—including biotic and abiotic biodegradation rates, removal during wastewater treatment, volatilization from water sources, and organic carbon:water partition coefficient ($\log K_{OC}$)—are parameters used in the current risk evaluation. In assessing the environmental fate and transport of DIBP, EPA considered the full range of results from the available highest quality data sources obtained during systematic review. Information on the full extracted dataset is available in the *Draft Risk Evaluation for Diisobutyl Phthalate (DIBP) – Systematic Review Supplemental File: Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport* ([U.S. EPA, 2025j](#)). Other fate estimates were based on modeling results from EPI Suite™ ([U.S. EPA, 2012a](#)), a predictive tool for physical and chemical properties and environmental fate estimation. Information regarding the model inputs is available in the *Draft Physical Chemistry and Fate and Transport Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025z](#)).

EPA evaluated the reasonably available information to characterize the environmental fate and transport of DIBP; the key points of the fate assessment for DIBP ([U.S. EPA, 2025z](#)) are summarized below and listed in Table 2-2.

Given the consistent results from numerous high-quality studies, there is robust evidence that DIBP:

- has chromophores that absorb in the visible range of the solar light spectrum and is expected to undergo direct photolysis;
- will partition to organic carbon and particulate matter in air;
- will biodegrade in aerobic surface water, soil, and wastewater treatment processes;
- does not biodegrade in anaerobic environments;
- will be removed after undergoing wastewater treatment and will sorb to sludge at high fractions, with a small fraction being present in effluent;
- is not bioaccumulative;
- is not expected to biodegrade under anoxic conditions and might have high persistence in anaerobic soils and sediments; and
- has a relatively short half-life in surface water ($t_{1/2}$ = 5 days), which EPA assumed may be extended in surface waters proximal to points of continuous release where DIBP enters the environment at a rate at or above biodegradation.
- as a result of limited studies identified, there is moderate confidence that DIBP is expected to be partially removed in conventional drinking water treatment systems via sorption to suspended organic matter and filtering media; and
- will not significantly hydrolyze under standard environmental conditions, but hydrolysis rate was seen to increase with increasing pH and temperature in deep-landfill environments.

Findings with a robust weight of evidence supporting them had one or more high-quality studies that were largely in agreement with each other. Findings that were said to have a moderate weight of evidence were based on a mix of high- and medium-quality studies that were largely in agreement but varied in sample size and consistency of findings.

823 **Table 2-2. Summary of Environmental Fate Information for DIBP**

Parameter	Value	Source(s)	Data Quality Ranking
Octanol:water (Log K _{OW})	4.34	Ishak et al. (2016)	High
Organic carbon:water (Log K _{OC})	2.67 (average of 2.50, 2.56, and 2.86)	He et al. (2019)	High
Adsorption coefficient (Log K _d)	2.65–3.10 (suspended particulate matter/water) 3.97–4.30 (sediment/water)	Li et al. (2017)	High
Octanol:air (Log K _{OA})	9.47 (EPI Suite estimate)	U.S. EPA (2017a)	High
Air:water (Log K _{AW})	–4.3 (estimated) and –4.27 (estimated)	Lu (2009) Cousins and Mackay (2000)	High
Aerobic ready biodegradation in water	42–98% in 28 days	EC/HC (2015) ; BASF Aktiengesellschaft (2007a, 2007b)	High
Aerobic biodegradation in sediment (DBP as analog)	t _{1/2} = 2.9 days in natural river sediment collected from the Zhonggang, Keya, Erren, Gaoping, Donggang, and Danshui Rivers, Taiwan	Yuan et al. (2002)	High
Anaerobic biodegradation in sediment	0–30% after 56 days in marine sediment	NCBI (2020)	Medium
Aerobic biodegradation in soil (DBP as analog)	88.1–97.2% after 200 days in Chalmers slit loam, Plainfield sand, and Fincastle silt loam soils	Inman et al. (1984)	High
Hydrolysis	Rate constant at pH 10–12: 1.4E–03 M ^{–1} s ^{–1} t _{1/2} at pH 7: 5.3 years at 25 °C (estimated); t _{1/2} at pH 8: 195 days at 25 °C (estimated)	Wolfe et al. (1980) U.S. EPA (2017a)	High
Photolysis	Direct: expected to be susceptible to direct photolysis by sunlight; contains chromophores that absorb at wavelengths >290 nm Indirect: t _{1/2} = 1.15 days (27.6 hours) (estimated; based on a 12-hour day with 1.5E06 ·OH/cm ³ and ·OH rate constant of 9.26E–12 ·OH/cm ³ and ·OH cm ³ /molecule-sec)	NLM (2013) U.S. EPA (2017a)	High
Environmental degradation half-lives (selected values for modeling)	27.6 hours (air) 5 days (water) 10 days (soil) 45 days (sediment)	U.S. EPA (2017a)	High
Wastewater treatment plant (WWTP) removal	65–95%	U.S. EPA (1982) Tran et al. (2014)	High

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Parameter	Value	Source(s)	Data Quality Ranking
Aquatic bioconcentration factor (BCF)	30.2 L/kg wet weight (upper trophic Arnot-Gobas estimation)	U.S. EPA (2017a)	High
Aquatic bioaccumulation factor (BAF)	30.2 L/kg wet weight (upper trophic Arnot-Gobas estimation)	U.S. EPA (2017a)	High
Aquatic food web magnification factor (FWMF)	0.81 (experimental; 18 marine species)	Mackintosh et al. (2004)	High
Terrestrial bioconcentration factor (BCF)	2.23 at 0.13 mg/kg in onion, celery, pepper, tomato, bitter melon, eggplant, and long podded cowpea	Li et al. (2016)	High
Terrestrial biota-sediment accumulation factor (BSAF) (DBP as analog)	0.18–0.46 (<i>Eisenia fetida</i>)	Hu et al. (2005) Ji and Deng (2016)	High

824

3 RELEASES AND CONCENTRATIONS OF DIBP IN THE ENVIRONMENT

EPA estimated releases and concentrations of DIBP in the environment. Section 3.1 describes the approach and methodology for estimating releases. Estimates of environmental releases are presented in Section 3.2, whereas Section 3.3 presents the approach, methodology, and summary of concentrations of DIBP in the environment.

3.1 Approach and Methodology

This section provides an overview of the approach and methodology for assessing releases of DIBP to the environment from industrial, commercial, and consumer uses. Specifically, Sections 3.1.1 through 3.1.2 describe the approach and methodology for estimating releases to the environment from industrial and commercial uses, and Section 3.1.3 describes the approach and methodology for assessing down-the-drain releases from consumer uses.

3.1.1 Manufacturing, Processing, Industrial, and Commercial Use

This subsection describes the relationship of COU and OES and the use of DIBP in the case of each OES. Specifically, Section 3.1.1.1 provides a crosswalk of COUs to OESs, and Section 3.1.1.2 provides descriptions for the use of DIBP within each OES.

3.1.1.1 Crosswalk of Conditions of Use to Occupational Exposure Scenarios

EPA developed OESs to assess the environmental releases of, and occupational exposures to DIBP that result from the COUs listed in Table 1-1. An OES is associated with one or more DIBP COUs but in some cases multiple OESs were developed to assess a single DIBP COU because of the variability of the releases of and occupational exposures to DIBP that are expected to result from this COU. Table 1-1 and Table 3-2 provide a crosswalk between COUs and OESs.

For the purpose of this risk evaluation, distribution in commerce is the transportation of DIBP containing products and articles between sites at which DIBP manufacturing, processing, and use occurs or the transportation of DIBP-containing wastes for recycling or disposal. EPA expects all of the above-mentioned materials to be transported in closed system or otherwise to be transported in a form (*e.g.*, articles containing DIBP) such that there is negligible potential for releases except during an incident. Therefore, the Agency did not assess environmental releases of and occupational exposure to DIBP as a result of distribution in commerce.

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Table 3-1. Crosswalk of COUs to Assessed OES

COU			OES
Life Cycle Stage	Category	Subcategory	
Manufacturing	Domestic manufacturing	Domestic manufacturing	Manufacturing
Manufacturing	Import	Import	Repackaging into large and small containers
Processing	Repackaging (<i>e.g.</i> , laboratory chemicals)	Repackaging (<i>e.g.</i> , laboratory chemicals)	Repackaging into large and small containers
	Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastics converting
	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants
		Plasticizers in: – plastic product manufacturing	Plastic compounding
		Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Plastic compounding
			Incorporation into paints and coatings
		Processing aids, not otherwise listed	Plastic compounding
		Plastic and rubber products not covered elsewhere	Rubber manufacturing – rubber compounding and rubber converting
		Pre-catalyst manufacturing (<i>e.g.</i> , catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst
	Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing
	Recycling	Recycling	Recycling
Distribution in Commerce	Distribution in commerce	Distribution in commerce	Distribution in commerce

COU			OES
Life Cycle Stage	Category	Subcategory	
Industrial Use	Foam	Pipeline pigs	Manufacture of polyurethane foam for pipeline pigs
	Paints and coatings	Paints and coatings	Application of paints and coatings
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication of final product from articles
	Adhesives and sealants	Adhesives and sealants: – two-component glues and adhesives: – transportation equipment manufacturing	Application of adhesives and sealants – spray and non-spray
Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives	Application of adhesives and sealants – spray and non-spray
	Paints and coatings	Paints and coatings	Application of paints and coatings
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication of final product from articles
	Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals – solids and liquids
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Fabrication of final product from articles
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal

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Table 3-2. Crosswalk of Assessed OES to COUs

OES	COU		
	Life Cycle Stage	Category	Subcategory
Manufacturing	Manufacturing	Domestic manufacturing	Domestic manufacturing
Plastic compounding	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing
	Processing	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings
	Processing	Processing – incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed
Plastics converting	Processing	Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing
Use as a catalyst – formulation into pre-catalyst	Processing	Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (<i>e.g.</i> , catalyst component for polyolefins production)
Use as a catalyst – intermediate in polypropylene manufacturing	Processing	Processing as a reactant	Intermediate in plastic manufacturing
Repackaging into large and small containers	Manufacturing	Import	Import
	Processing	Repackaging (<i>e.g.</i> , laboratory chemicals)	Repackaging (<i>e.g.</i> , laboratory chemicals)
Use of laboratory chemicals – solids and liquids	Commercial Use	Laboratory chemicals	Laboratory chemicals
Incorporation into adhesives and sealants	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing
Application of adhesives and sealants – spray and non-spray	Industrial Use	Adhesives and sealants	Adhesives and sealants: – two-component glues and adhesives: – transportation equipment manufacturing
	Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives

OES	COU		
	Life Cycle Stage	Category	Subcategory
Incorporation into paints and coatings	Processing	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings
Application of paints and coatings	Industrial Use	Paints and coatings	Paints and coatings
	Commercial Use	Paints and coatings	Paints and coatings
Rubber manufacturing – rubber compounding and rubber converting	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere
Manufacture of polyurethane foam for pipeline pigs	Industrial Use	Foam	Pipeline pigs
Recycling	Processing	Recycling	Recycling
Distribution in commerce	Distribution in Commerce	Distribution in commerce	Distribution in commerce
Fabrication of final product from articles	Industrial Use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
	Commercial Use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
	Commercial Use	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment
Waste handling, treatment, and disposal	Disposal	Disposal	Disposal

3.1.1.2 Description of DIBP Use for Each OES

A brief description of the process and/or of the use of DIBP in the case of each OES is presented in Table 3-3.

Table 3-3. Description of the Use of DIBP for Each OES

OES	Use of DIBP
Manufacturing	DIBP may be produced through the catalytic esterification of phthalic anhydride with isobutanol in a closed system. Typical manufacturing operations consist of esterification followed by a purification process using vacuum distillation or activated charcoal.
Repackaging into large and small containers	DIBP is imported domestically for use and/or may be repackaged before shipment to formulation sites.

OES	Use of DIBP
Incorporation into adhesives and sealants	DIBP is a plasticizer in adhesives and sealants for industrial and commercial use, including grouts and industrial adhesives.
Incorporation into paints and coatings	DIBP is an additive in paints and coatings for industrial and commercial use, including paints and colorants.
Use as a catalyst	DIBP is used as an electron donor in pre-catalyst formulations that are ultimately used as a catalyst intermediate in polypropylene (PP) manufacturing.
Application of paints and coatings	Industrial and commercial sites use DIBP-containing paints and coatings that are roll, brush, trowel, and spray applied.
Application of adhesives and sealants	DIBP is used in a variety of adhesive and sealant products including anchoring adhesive, grouts, and seam adhesives. Application methods include caulk gun, syringe, roll, bead, dip and spray application.
Use of laboratory chemicals	DIBP is used for laboratory analyses in both solid and liquid forms.
Fabrication of final product from articles	DIBP is found in a wide array of different final articles not found in other OESs, including rifle cartridges, glitter boards, and polyurethane foams.
Plastic compounding	DIBP is used as a plasticizer in PVC and plastic resins product manufacturing.
Plastics converting	DIBP is used as a plasticizer in PVC and plastic resins product manufacturing.
Rubber manufacturing	DIBP is used in non-PVC polymers, such as rubber.
Manufacture of polyurethane foam for pipeline pigs	DIBP is used as a plasticizer in polyurethane foam used to make pipeline pigs to service industrial pipelines.
Recycling	A fraction of plastics is recycled either in-house or at PVC recycling facilities for continuous compounding of new PVC material.
Waste handling, treatment, and disposal	Upon manufacture or use of DIBP-containing products, residual chemical is disposed and released to air, wastewater, or disposal facilities.

863

864 3.1.2 Daily Release Estimation

865 EPA assessed releases of DIBP to the environment or to disposal in accordance with Emission Scenario
866 Documents (ESDs) and Generic Scenarios (GSs) because reported release data (*e.g.*, DIBP TRI data) are
867 lacking. This approach involves the assessment of releases of a chemical substance from the generic site
868 of an OES. Specifically, EPA assesses the rate of release of a chemical substance from each of various
869 sources of release that are located at the generic site. The Agency also assesses the environmental
870 medium in which the release occurs or the disposal method of the release in the case of each of the
871 release sources in accordance with an ESD, GS, or EPA model. There are multiple environmental media
872 of release or disposal methods in the case of releases from some release sources because of uncertainty
873 about the media of release or disposal methods at the actual sites that are associated with the COU and
874 the OES.

875

876 The assessment of releases of a chemical substance in accordance with ESDs and GSs involves the
877 calculation of a daily site throughput or batch volume of the chemical substance and the calculation of

the daily rate of release of the chemical substance from this daily site throughput or batch volume using EPA models. EPA estimated a daily DIBP site throughput in the case of each OES and then calculated the daily rates of DIBP releases from this estimated daily DIBP site throughput using EPA models. For the most part, the Agency estimated the daily DIBP site throughput of an OES by calculating this parameter from the following parameters: (1) the DIBP production volume associated with the OES; (2) the number of DIBP manufacturing, processing, or use sites associated with the OES; and (3) the number of days of operation of the generic site of the OES. Alternatively, the Agency estimated the daily DIBP site throughput of an OES from an estimate of the daily site throughput of the product that contains DIBP (e.g., coatings products) and concentrations of DIBP in this product. When available, EPA utilized data reported under CDR to determine production volumes and safety data sheets (SDSs) to determine product concentrations. Table 3-4 contains the Agency's estimates of production volume and number of sites in the case of each OES, and brief summaries of the rationale for these estimates. This table also contains information about daily site throughput of the product that contains DIBP and concentration of DIBP in this product in the case of relevant OESs.

The number of days per year during which DIBP is released to the environment from sites at which DIBP is manufactured, processed, used or disposed of is unknown to EPA. Accordingly, the Agency estimated the number of release days per year per site in the case of each OES. To estimate this parameter, EPA assumed that DIBP releases from all of the sources of release at a generic site with few exceptions occur during each day of operations involving DIBP at the site and, as stated above, EPA estimated the number of such days in the case of each OES. As presented in Table 3-5, the Agency estimated the number of operating days as a range of values that is derived from literature that is mainly GSs or ESDs or as 250 days/year if such information is lacking. The exceptions referenced above are releases from equipment and container cleaning in the case of a few of the OESs; the Agency estimated the number of release days in these cases as 1 or 4 days per year in the case of equipment cleaning and as the number of unloaded containers in the case of container cleaning.

The DIBP production volume associated with an OES and the number of DIBP manufacturing, processing or use sites associated with an OES that EPA estimated are uncertain and the Agency estimated these parameters as probability distributions if data were available to do that. With regard to the generic site of an OES, in some cases EPA estimated the number of days of operation at the site, and/or the daily site throughput of the product that contains DIBP (e.g., coatings products) and concentrations of DIBP in this product as probability distributions to incorporate the expected variability of these parameters in the case of actual sites although these probability distributions are uncertain. The models that EPA used to assess the daily rates of DIBP releases include model parameters that the Agency also estimated as probability distributions in some cases because of uncertainty about the values of these parameters in the case of actual sites. EPA used Monte Carlo simulation to calculate the daily rates of DIBP releases to incorporate values of parameters that were estimated as probability distributions into the calculations of these release rates, and these release rates were calculated as probability distributions. A comprehensive description of EPA methodology for the assessment of the daily rates of DIBP releases is given in the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)).

920 **Table 3-4. Estimated Production Volume and Number of Sites for Each OES for DIBP^a**

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
Manufacturing	184,750	1	The 2020 DIBP CDR information (U.S. EPA, 2020a) consists of information about LANXESS Corporation only. According to this information, this company manufactured 184,750 kg of DIBP in 2019 at a single site in Greensboro, NC.	(U.S. EPA, 2020a)
Plastic compounding	184,750	1–9	The DIBP manufactured by LANXESS Corporation was processed to manufacture plastic products and this processing occurred at <10 sites (U.S. EPA, 2020a). Therefore, the production volume of this OES equals the manufacturing production volume, and the number of sites was assessed as a uniform distribution with lower and upper bounds of 1 and 9 sites, respectively.	
Plastics converting	184,750	6–70	Plastic converting occurs downstream of plastic compounding and therefore the production volumes of these two OESs are equal. EPA calculated the number of plastic converting sites in accordance with the Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f) as the ratio of the DIBP production volume that is used in plastic converting annually to the annual DIBP site throughput at a plastic converting site on average. Furthermore, this DIBP site throughput was calculated from estimates of the following 3 parameters: (1) the total of the average annual site throughputs of various plastic additives, (2) the concentration of DIBP in plastic and (3) the total of the average concentrations of various plastic additives in plastics. Estimated values of the first and third of these 3 parameters are given in the Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f). The concentration of DIBP in plastics is equal to 0.65–7.4 weight % (Danish EPA, 2011) and therefore EPA estimated the concentration of DIBP in plastics to be equal to this range of values. This resulted in a range of values of number of sites equal to 6–70 sites and EPA assumed a uniform distribution of number of sites with this range of values.	(U.S. EPA, 2021f) (Danish EPA, 2011)
Use as a catalyst – formulation into pre-catalyst	19,125–76,500	2–5	EPA assumed all polypropylene produced in the United States is produced using DIBP-containing catalyst and calculated the production volume of this OES as a range of values from the U.S. production volume of polypropylene in 2019, which is 7.65 million tons (Jaganmohan, 2020), and the concentration of DIBP in polypropylene, which is 2.5–10 ppm (W. R. Grace & Co., 2022). The Agency then assumed a uniform distribution of the values of the range of DIBP production volume of this OES. The Agency estimated the number of sites as a uniform distribution with a range of values of 2–5 sites based on information	(Jaganmohan, 2020) (W. R. Grace & Co., 2022) (Lyondell, 2022)

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
			about the number of catalyst manufacturing sites of the following companies: W.R. Grace and Company and LyondellBasell (Lyondell, 2022 ; W. R. Grace & Co., 2022).	(W. R. Grace & Co., 2024)
Use as a catalyst – intermediate in polypropylene manufacturing	19,125–76,500	19–38	The production volume of this OES equals to the production volume of the OES of the Use as a catalyst – formulation into pre-catalyst because products of that OES are feed material in the case of this OES. EPA calculated the number of sites of this OES (<i>i.e.</i> , the number of polypropylene manufacturing sites at which DIBP is used) as the ratio of the annual U.S. polypropylene production volume in 2019, which is 7.65 million tons (Jaganmohan, 2020), and the annual throughput of polypropylene at polypropylene manufacturing sites, which is equal to 200–400 million kg/site-year (Lyondell, 2022). The Agency assumed a uniform distribution of values of the range of annual throughput of polypropylene at polypropylene manufacturing sites and calculated the number of sites of this OES as a probability distribution.	
Repackaging into large and small containers	45,359	1–355	EPA estimated the production volume of this OES to be equal to the upper threshold for CDR reporting, which is equal to 100,000 lb (45,359 kg). The Agency estimated the daily DIBP site throughput as a triangular distribution of 1 to 315,479 kg/site-year with a mode of 7,000 kg/site-year based on the Chemical Repackaging GS (U.S. EPA, 2022a). The Agency then calculated the number of repackaging sites as a probability distribution from the ratio of the production volume and the daily DIBP site throughput of this OES. Although the maximum number of sites is 355, the 99th percentile value of this parameter is equal to 10 sites.	(U.S. EPA, 2022a)
Use of laboratory chemicals	9,327	9–27,858	EPA estimated the production volume of this OES to be equal to 5% of the manufacturing production volume. EPA calculated the number of sites from an estimate of the daily DIBP site throughput in the case of laboratory liquid use, which EPA calculated from the Generic Scenario on Use of Laboratory Chemicals (U.S. EPA, 2023f). Although the maximum number of sites is 27,858, the 99th percentile value of this parameter is equal to 986 sites.	(U.S. EPA, 2023f)
Incorporation into adhesives and sealants	3,694	1	According to the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011), 6% of the DIBP production volume is used in non-PVC, non-polymer end use categories. Based on this, EPA conservatively assumed the production volume of DIBP that is used in the case of 4 certain OESs to be equal to 2% of the DIBP production volume that EPA assessed in the case of the manufacturing	(Danish EPA, 2011) (U.S. EPA, 2021a)

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OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
			of DIBP. These 4 OESs are the following: incorporation into adhesives, sealants, paints and coatings, and manufacture of rubber and polyurethane foam for pipeline pigs. The annual production volume in the case of each of these OESs is 2% of 184,750 kg or 3,694 kg. EPA assessed one site because a single site, Sika Corp in Lyndhurst, NJ, reported the use of DIBP in adhesives manufacturing according to the 2016 CDR information (U.S. EPA, 2021a).	
Application of adhesives and sealants	3,694	1–129	The production volume of this OES equals to the production volume of the OES of incorporation into adhesives and sealants because products of that OES are feed material in the case of this OES. EPA calculated the daily DIBP site throughput of this OES as a probability distribution from estimates of the average daily site throughput of adhesive products (OECD, 2015b), the production volume of this OES, and the concentrations of DIBP in adhesive and sealant product as reported in SDSs of adhesive and sealant products that contain DIBP. This calculation is explained in Section 3.7 and Appendix D.8 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t). Appendix E of this document contains the citations of the SDSs referenced above and the overall quality rating of these documents is high or medium. The Agency calculated the number of sites as the ratio of the production volume of the OES and the daily DIBP site throughput.	(OECD, 2015b)
Incorporation into paints and coatings	3,694	1–2	Refer to the rationale for the production volume of the OES of incorporation into adhesives and sealants for the rationale for the production volume of this OES. With regard to the number of sites, EPA’s systematic review resulted in SDSs of paint products that contain DIBP but EPA did not infer a number of sites based on this information. Therefore, the Agency assumed the number of sites as a discrete distribution of 1–2 sites.	None
Application of paints and coatings	3,694	2–127	The production volume of this OES equals to the production volume of the OES of Incorporation into paints and coatings because products of that OES are feed material in the case of this OES. EPA calculated the daily DIBP site throughput of this OES as a probability distribution from estimates of the average daily site throughput of radiation curable coating products (OECD, 2011b), the production volume of this OES, and the concentrations of DIBP in paints and coatings product as reported in SDSs of paints and coatings products that contain DIBP.	(OECD, 2011b)

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OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
			This calculation is explained in Section 3.6 and Appendix D.7 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t). Appendix E of this document contains the citations of the SDSs referenced above and the overall quality rating of these documents is high or medium. The Agency calculated the number of sites as the ratio of the production volume of the OES and the daily DIBP site throughput.	
Rubber manufacturing	3,694	1	Refer to the rationale for the production volume of the OES of incorporation into adhesives and sealants for the rationale for the production volume of this OES. EPA calculated the number of sites as the ratio of the DIBP production volume that is used in rubber manufacturing annually to the annual DIBP site throughput at a rubber manufacturing site on average. The Agency calculated this DIBP site throughput similarly to the calculation of the annual DIBP site throughput at a plastic converting site on average. The only difference in these two calculations is that the calculation pertaining to the rubber manufacturing OES involves the concentration of DIBP in rubber products instead of the concentration of DIBP in plastics. The Agency determined the concentration of DIBP in rubber products as the range of values of 0.1–20% based on the concentration of plasticizers in non-PVC plastics, which is 1–5% (U.S. EPA, 2021e) and the concentration of rubber additives in rubber, which is 10–20% (OECD, 2004a) (all concentrations are weight percent.) The calculated number of sites is 0.002–0.04 and therefore the Agency assumed a single site.	(U.S. EPA, 2021e) (OECD, 2004a)
Manufacture of polyurethane foam for pipeline pigs	3,694	1	Refer to the rationale for the production volume of the OES of incorporation into adhesives and sealants for the rationale for the production volume of this OES. EPA assumed a single site because this use of DIBP is mentioned by a single company (LANXESS, 2021b).	(LANXESS, 2021b)
Recycling	5,543	59	According to Milbrandt (2022), 3% of plastic products are recycled and therefore EPA estimated the production volume of this OES to be equal to 3% of the production volume of the plastic converting OES. The Agency assessed 59 recycling sites because there are 59 PVC recyclers as of January 22, 2024 (ENF, 2024).	Milbrandt (2022) (ENF, 2024)

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
Fabrication of final product from articles	N/A		EPA did not assess these OESs quantitatively.	N/A
Waste handling, treatment, and disposal				
^a The estimation of production volume and number of sites is documented in detail in Section 3 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t).				

Table 3-5. Estimated Number of Operating Days per Year for Each OES for DIBP^a

OES(s)	Operating Days (days/year)	Basis	Reference(s)
Manufacturing; Incorporation into adhesives and sealants; Incorporation into paints and coatings; Use as a catalyst; Fabrication of final product from articles; Waste handling, treatment, and disposal	250	EPA assumed the manufacture, processing, use or disposal of DIBP occurs 5 days per week during every week of the year except for 2 weeks because of maintenance turnarounds in the case of these OESs.	None
Repackaging into large and small containers	174–260	The number of days during which a chemical substance is repackaged at a repackaging site is equal to this range of values according to the 2022 GS on Chemical Repackaging (U.S. EPA, 2022a).	GS on Chemical Repackaging (U.S. EPA, 2022a).
Application of paints and coatings	225–300	EPA assessed an operating day range of 225–300 days/yr. The lower-bound is based on ESIG’s Specific Environmental Release Category Factsheet for Industrial Application of Coatings by Spraying (CEPE, 2020). The upper bound is based on the European Risk Report for DIDP (ECJRC, 2003), which provided a default of 300 days/yr. The mode is based on the GS for Automobile Spray Coating (SAI Corporation, 1996), which estimates 250 days/yr, based on 50 weeks/yr of 5 days/week operation.	ESIG’s Specific Environmental Release Category Factsheet for Industrial Application of Coatings by Spraying (CEPE, 2020) European Risk Report for DIDP (ECJRC, 2003)

OES(s)	Operating Days (days/year)	Basis	Reference(s)
			GS for Automobile Spray Coating (SAI Corporation, 1996)
Application of adhesives and sealants	225–300	The number of days during which adhesives and sealant products that contain a certain chemical substance are used at a site is equal to this range of values according to the Emission Scenario Document on Use of Adhesives (OECD, 2015b).	Emission Scenario Document on Use of Adhesives (OECD, 2015b)
Use of laboratory chemicals	174–260	The number of days during which a chemical substance is used at a laboratory is equal to this range of values according to the 2023 GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f).	GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f)
Plastic compounding	148–264	The number of days during which a chemical substance is processed at plastic compounding sites is equal to this range of values according to the Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e).	Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e)
Plastics converting	137–254	The number of days during which a chemical substance is processed at plastic converting sites is equal to this range of values according to the Generic Scenario on the Use of Additives in Plastics Converting (U.S. EPA, 2021f).	Generic Scenario on the Use of Additives in Plastics Converting (U.S. EPA, 2021f)
Rubber manufacturing	Compounding: 148–264 Converting: 137–254	EPA assumed the number of operating days in the case of rubber compounding and converting is equal to the number of operating days in the case of plastic compounding and converting, respectively.	None
Recycling	148–264	EPA assumed the number of operating days in the case of recycling is equal to the number of operating days in the case of plastic compounding.	None
^a The estimation of the number of operating days per for each OES is documented in detail in Section 3 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t).			

3.1.3 Consumer Down-the-Drain and Landfills

EPA evaluated down-the-drain and landfill releases of DIBP from consumer COUs qualitatively. The Agency acknowledges there may be DIBP releases to the environment via the cleaning and disposal of adhesives and sealants, and paints and coatings.

Environmental releases can occur from consumer products and articles containing DIBP via the end-of-life disposal of consumer products and articles in the built environment or landfills, as well as from the associated down-the-drain release of DIBP. It is difficult for EPA to quantify these end-of-life and down-the-drain exposures due to limited reasonably available information on source attribution by consumer COUs. For example, adhesives and sealants as well as paints and coatings can be disposed down-the-drain while consumer users wash their hands, brushes, sponges, and other product applying tools. However, there is limited reasonably available information on wastewater treatment water and the removal of DIBP in drinking water treatment plants that can be matched to individual COUs or product examples. As stated in the *Draft Environmental Media and General Population Exposure and Environmental Exposure for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)), wastewater treatment is expected to remove 65 to 90 percent of DIBP through sorption to biosolids. In addition, DIBP sorption to biosolids and organic matter results in removal from the aqueous phase by settlement in wastewater treatment processes. Thus, as DIBP is expected to be removed during wastewater treatment, EPA does not expect a significant amount of DIBP to re-enter drinking water.

In addition, adhesives and sealant and paints and coatings products are disposed of when users no longer have use for them or when the products have reached the product shelf life and are taken to landfills. All other solid products and articles can be disposed in landfills or other waste handling locations that properly manage the disposal of products like adhesives and sealants and paints and coatings. DIBP is expected to have a high affinity to particulate ($\log K_{OC} = 2.67$) and organic media ($\log K_{OW} = 4.34$) that would cause significant retardation in groundwater and limit leaching to groundwater. Because of its high hydrophobicity and high affinity for soil sorption, it is unlikely that DIBP will migrate from landfills after groundwater infiltration ([U.S. EPA, 2025s](#)).

3.2 Summary of Environmental Releases

3.2.1 Manufacturing, Processing, Industrial and Commercial

Table 3-6 contains the release assessment results for all OESs and the overall confidence score for each OES. See the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)) for additional details on deriving the overall confidence score for each OES. For the Fabrication and final use of products or articles as well as the Waste handling, treatment, and disposal OESs, EPA was not able to estimate releases.

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Table 3-6. Summary of EPA's Daily Release Estimates for Each OES and EPA's Overall Confidence in these Estimates

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
Manufacturing	1.1E-04	3.1E-04	Fugitive air	250	1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)	
	0.74		Stack air					
	4.6E-03		Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	17 ^j	18 ^j	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
Repackaging into large and small containers	8.8E-06	1.4E-05	Fugitive air	208	260	1–355 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	11 ^j	29 ^j	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or landfill					
Incorporation into adhesives and sealants	2.6E-08	5.6E-08	Fugitive air	250	1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)	
	2.5E-08	8.0E-08	Stack air					
	0.34 ^j	0.37 ^j	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	0.44		Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
Incorporation into paints and coatings	2.1E-06	6.6E-06	Fugitive air	250	1–2 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)	
	2.3E-06	1.5E-05	Stack air					
	0.19 ^j	0.37 ^j	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	0.24	0.47	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
Use as a catalyst – formation of pre-catalyst	5.1E-07	1.0E-06	Fugitive air	250	2–5 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)	
	1.3E-06	4.4E-06	Stack air					
	4.6 ^j	8.9 ^j	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					

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OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
Use as a catalyst – use as an intermediate in polypropylene manufacturing	1.6E-03	7.8E-03	Stack air	250		19–38 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.0E-03	1.0E-02	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	0.49 ^j	0.83 ^j	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
	2.5E-03	1.1E-02	Incineration, or landfill					
Application of paints and coatings (with engineering controls)	1.6-06	4.7E-06	Fugitive air	258	257	2–127 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	9.9E-02	0.29	Stack air					
	4.0E-02	0.11	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	0.94	2.7	Incineration or landfill					
Application of paints and coatings (without engineering controls)	1.56E-06	4.66E-06	Fugitive air	258	257	2–127 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	4.0E-02	0.13	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
	0.99	2.9	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	4.7E-02	0.12	Incineration or landfill					
Application of adhesives and sealants	2.3E-06	5.3E-06	Fugitive or stack air	214	247	2–823 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.17	0.76	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	236	134			

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OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
Use of laboratory chemicals (liquid)	1.2E-07	2.0E-07	Fugitive or stack air	230	236	9-27,858 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.0	3.7	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	228	237			
Use of laboratory chemicals (solid)	1.2E-06	3.1E-06	Stack air	231	227	36,873 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	3.1E-06	4.9E-06	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	232	223			
	8.3E-07	2.5E-06	Incineration or landfill	230	227			
	1.1E-03	1.3E-03	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill	234	193			
Fabrication of final product from articles ^g	N/A							
Plastics compounding	3.4E-03	1.7E-02	Fugitive or stack air	216	219	1-9 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.57	4.2	Stack air	218	215			
	1.4	8.8	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	218	216			
	4.6	34	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	204	222			
	1.7	8.4	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	216	219			
	0.39	3.1	Incineration or landfill	218	216			

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OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
Plastics converting	1.3E-03	7.4E-03	Fugitive or stack air	214	208	6-70 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	7.6E-02	0.52	Stack air	213	209			
	0.19	1.1	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	213	210			
	0.77	3.3	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	212	208			
	0.23	1.0	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	211	205			
	0.65	2.8	Incineration or landfill	211				
Rubber manufacturing (compounding)	3.2E-04	4.2E-04	Fugitive or stack air	175	234	1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.12	0.39	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	223	230			
	4.8E-02	0.21	Stack air	224	229			
	0.65	0.92	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	94	123			
	0.16	0.21	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	175	234			
	3.3E-02	0.16	Incineration or landfill	224	229			

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OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
Rubber manufacturing (converting)	5.4E-04	2.1E-03	Fugitive or stack air	137	172	1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.13	0.41	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	209	214			
	5.2E-02	0.22	Stack air	210	213			
	0.53	3.6	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	202	210			
	0.47	0.67	Incineration or landfill	192	212			
	0.17	0.23	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	162	218			
Manufacture of polyurethane foam for pipeline pigs ^h	N/A							
Recycling	1.3E-03	5.5E-03	Stack air	218	214	59 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	1.0E-02	2.5E-02	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	218	213			
	1.4E-02	1.9E-02	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	138	106			
	4.2E-03	5.5E-03	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment)	223	171			
Waste handling, treatment, and disposal ⁱ	N/A							

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OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Release Frequency Across Sites (days) ^d		Number of Facilities ^e	Weight of Scientific Evidence Rating ^f	Source
	Central Tendency	High-End		Central Tendency	High-End			
^a Direct discharge to surface water; indirect discharge to non-POTW; indirect discharge to POTW								
^b Emissions via fugitive air or stack air, or treatment via incineration								
^c Transfer to surface impoundment, land application, or landfills								
^d For the OESs where a range was used as an input to the monte carlo simulation, EPA calculated the number of release days as the ratio of the annual release rate per site to the daily release rate per site because the outputs of the Monte Carlo software do not include the specific values of the numbers of release days from which the 50th and 95th percentile release rates are calculated. For some OESs, a range of input for operating days was not available and 250 days/yr (5 days/week for 50 weeks/yr) was used as the number of release days.								
^e Where available, EPA used 2020 CDR (U.S. EPA, 2020a), 2020 U.S. County Business Practices (U.S. Census Bureau, 2022), and Monte Carlo models to estimate the number of actual sites that use DIBP for each COU.								
^f See Section 3.2.2 for details on EPA’s determination of the weight of scientific evidence rating.								
^g No data were available to estimate releases for this OES and there were no suitable surrogate release data or models. Releases from Fabrication of final product from articles is described qualitatively in the <i>Draft Environmental Release and Occupational Exposure Assessment for Phthalate (DIBP)</i> (U.S. EPA, 2025t).								
^h Releases from this OES are assessed using results from the Plastics compounding OES, Plastics converting OES, and Rubber manufacturing OES are representative of the Manufacture of polyurethane foam for pipeline pigs OES. Thus, this table does not repeat these estimates for this OES.								
ⁱ Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred is generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities. Therefore, they may include amounts received at dedicated waste treatment/disposal sites.								
^j Each of these values was calculated by summing the rates of release for various releases that occur at different frequencies. These include releases such as release of sampling waste, which occur at the frequency specified in the table (<i>e.g.</i> , 250 days/year) and releases such as the release of equipment cleaning waste, which occur at a lower frequency (<i>e.g.</i> , 1 day/year). For example, in the case of the manufacturing OES, the central tendency rates of release of sampling wastes and equipment cleaning wastes are 2.2 and 14.8 kg/site-day, respectively, and the high-end rates of release of sampling wastes and equipment cleaning wastes are 2.9 and 14.8 kg/site-day, respectively. The frequency of the releases of product sampling wastes is 250 days/year but the frequency of release of equipment cleaning wastes is only 1 day/year.								

3.2.2 Weight of Scientific Evidence Conclusions for Environmental Releases from Industrial and Commercial Sources

EPA determined the weight of scientific evidence in accordance with the Draft Systematic Review Protocol ([U.S. EPA, 2021b](#)). Judgment on the weight of scientific evidence is based on the strengths, limitations, and uncertainties associated with the estimates of the daily rate of release of DIBP from the generic site and the number of release days. The Agency considers factors that increase or decrease the strength of the evidence supporting these release estimate. Factors that increase or decrease the strength of evidence are provided in Table 7-6 of the Draft Systematic Review Protocol ([U.S. EPA, 2021b](#)) whereas Table 7-7 provides example judgements based on the information in Table 7-6. The best professional judgment about the weight of scientific evidence is summarized using the descriptors of robust, moderate, slight, or indeterminate ([U.S. EPA, 2021b](#)).

Strengths

The strengths of the release estimates in general are as follows: (1) the overall systematic review quality ratings of the references cited in Table 3-4 and Table 3-5 are medium or high; (2) EPA determined sources of releases and the corresponding media of releases or disposal methods at the generic sites of the OESs in accordance with ESDs and GSs that are related to these OESs respectively and that contain well described methodologies; (3) the computational or scientific bases for deriving the estimates of daily rates of release of DIBP from the generic sites of the OESs are robust and all of the data that the Agency used to inform the modeling parameter distributions have overall data quality ratings of either high or medium; and (4) daily rates of release of DIBP were calculated via Monte Carlo simulation from model input parameters that in some cases are variable. Parameter variation increases the likelihood that the calculated daily rates of release of DIBP encompass the true daily release rates.

Limitations

The major limitation of the release estimates in general is uncertainty about the estimates of daily DIBP site throughputs, which are the input variables of the models that EPA used to calculate daily release rates. The reasons for this uncertainty are the uncertainties in the values of the parameters from which the daily DIBP site throughputs were calculated. The following is a discussion of these uncertainties:

- CDR information on the downstream processing and use of DIBP at facilities is limited; therefore, the assessed production volume of an OES is uncertain. EPA estimated production volume deterministically (*i.e.*, as a single value) based on reported CDR data, CDR reporting thresholds, the national aggregate production volume of 407,303 lb for DIBP in 2019 and/or literature data. The exception is the OES of Use as a catalyst where EPA estimated the production volume as a range of values based on literature data.
- EPA estimated the number of release days and the number of sites in the case of most or some OESs, respectively, from the relevant data of GSs, ESDs, or emission release category (specific emission release category [SpERC]) factsheets but these data may not be pertinent in the case of actual sites at which DIBP is manufactured, processed, or used.
- There are uncertainties associated with DIBP-containing product concentrations. In most cases, the number of identified products for a given OES were limited. In such cases, EPA estimated a range of possible concentrations for products in the OES. However, the extent to which these products represent all DIBP-containing products within the OES is uncertain. For OESs with little-to-no reasonably available product data, EPA estimated DIBP concentrations from GSs or ESDs. Due to these uncertainties, the average product concentrations may be under- or overestimated.

1008 In addition to the major limitation discussed above, other limitations are uncertainties in the values of
1009 some of the parameters of the models that EPA used to estimate releases. Table 3-7 contains a summary
1010 of the assessment approaches in the case of each OES and the strengths and limitations of the release
1011 estimates.

1012
1013 ***Uncertainties***

1014 Given the strengths and limitations discussed above, EPA is uncertain that the assessed daily release
1015 rates are representative of actual daily release rates of the corresponding COU. Refer to Table 3-7 for
1016 discussions of uncertainties in the case of each OESs. Based on the above information, EPA has slight to
1017 moderate confidence in the assessed releases.

1018

Table 3-7. Summary of Assessment Approach and Uncertainty in Environmental Release Estimates for DIBP by OES

OES	Assessment Approach and Uncertainty in Release Estimates
Manufacturing	EPA assessed environmental releases using models and model parameters derived from CDR, the 2023 Methodology for Estimating Environmental Releases from Sampling Wastes, and sources identified through systematic review (including industry-supplied data). The Agency used facility-specific reported DIBP manufacturing volumes for 1 facility reporting in CDR.
Repackaging	EPA assessed environmental releases using the assumptions and values from the Chemical Repackaging GS, which the systematic review process rated high for data quality (OECD, 2009b). The Agency also referenced the 2023 Methodology for Estimating Environmental Releases from Sampling Wastes. An uncertainty in the assessment approach is that the default values in the ESD are generic and there is uncertainty in the representativeness of these generic values to actual releases from real-world sites that import and repackage DIBP. In addition, EPA lacks DIBP-specific facility import volume data for the CDR-reporting import and repackaging site; therefore, throughput estimates for these sites are based on the CDR reporting range upper bound of 100,000 lb (45,359 kg). There is uncertainty in the extent to which this estimated volume represents the actual volume of DIBP repackaged, due to CDR reporting thresholds that may result in additional DIBP repackaging sites that are not required to report to CDR. Furthermore, some repackaging sites may not be importers and therefore would not be subject to CDR reporting requirements.
Incorporation into adhesives and sealants	EPA assessed releases to the environment using the Emission Scenario Document on Adhesive Formulation, which also has a high data quality rating from the systematic review process (OECD, 2009a). EPA used DIBP-specific data on concentrations in adhesive and sealant products in the analysis to provide more accurate estimates than the generic values provided by the ESD. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the ESD are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that incorporate DIBP into adhesives and sealants. In addition, EPA lacks DIBP-specific facility production volume data and number of formulation sites; in addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Incorporation into paints and coatings	EPA assessed releases to the environment using the Generic Scenario for Formulation of Waterborne Coatings, which has a medium data quality rating from the systematic review process (EPA, 2014). The Agency used DIBP-specific data on concentrations in paint and coating products in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS are generic and specific to waterborne coatings, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that incorporate DIBP into paints and coatings and how representative the estimates are for sites formulating other coating types (<i>e.g.</i>, solvent-borne coatings). In addition, EPA lacks DIBP-specific facility production volume data and number of formulation sites; therefore, throughput estimates are based on CDR which has a reporting threshold of 25,000 lb (11,340 kg) (<i>i.e.</i>, not all potential sites represented) and market data from the 2003 Danish EPA Restriction

OES	Assessment Approach and Uncertainty in Release Estimates
	Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Use as a catalyst	EPA assessed releases to the environment using the Emission Scenario Document on Adhesive Formulation (OECD, 2009a), which has a medium data quality rating from the systematic review process. The Agency used DIBP-specific data on concentrations in different DIBP-containing catalysts in the analysis to provide more accurate estimates than the generic values provided by the ESD. The Zeigler Natta technical report from which these values were obtained have medium data quality ratings from the systematic review process (Company Withheld, XXXX). EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and industry data from the 2019 U.S. polypropylene production volume (Jaganmohan, 2020). Because the default values in the GSs are generic for all types of use sites and the DIBP-specific concentration data was only for Zeigler Natta catalyst, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use catalysts containing DIBP. In addition, EPA lacks DIBP-specific facility production volume data and number of polypropylene manufacturing sites; therefore, throughput estimates are based on CDR, which has a reporting threshold of 25,000 lb (11,340 kg) (<i>i.e.</i>, not all potential sites represented) and a magnitude-different low- and high-range of estimated annual DIBP production.
Application of paints and coatings	EPA assessed releases to the environment using the Emission Scenario Document on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a), Emission Scenario Document on the Coating Industry (Paints, Lacquers, and Varnishes) (OECD, 2009c), and Emission Scenario Document on the Application of Radiation Curable Coatings, Inks, and Adhesives via Spray, Vacuum, Roll, and Curtain Coating (OECD, 2011b), which were all assigned a data quality score of medium in systematic review. Additionally, EPA used DIBP-specific data on concentration and application methods of different DIBP-containing paints and coatings in the analysis to provide more accurate estimates than the generic values provided by the GS and ESDs. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS and ESDs are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use DIBP-containing paints and coatings. EPA assessed releases of spray applications of the coatings, which may not be representative of other coating application methods. In addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP used for each OES as presented in the Danish EPA Restriction Report may differ from actual U.S. conditions, adding uncertainty to estimated releases.
Application of adhesives and sealants	EPA assessed releases to the environment using the Emission Scenario Document on Use of Adhesives, which has a medium data quality rating from the systematic review process (OECD, 2015a). Additionally, the Agency used DIBP-specific data on concentration and application methods of different DIBP-containing adhesives and sealant products in the analysis to provide more accurate estimates than the generic values provided by the ESD. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the ESD are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use DIBP-containing adhesives and sealants. EPA assessed releases of spray applications of the

OES	Assessment Approach and Uncertainty in Release Estimates
	adhesives and sealants, which may not be representative of other coating application methods such as dip application of casting sealant products or the application of grout products. In addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Use of laboratory chemicals	EPA assessed releases to the environment using the Generic Scenario on Use of Laboratory Chemicals, which has a high data quality rating from the systematic review process (U.S. EPA, 2023f). The Agency assessed media of release using assumptions from the GS and EPA/OPPT models for solid and liquid DIBP-containing laboratory chemicals. EPA used SDSs from identified laboratory DIBP products to inform product concentration and material states. These SDSs have high data quality ratings from the systematic review process. The Agency lacks DIBP laboratory chemical throughput data and use information from the GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f). Additionally, because no entries in CDR indicate a laboratory use and there were no other sources to estimate the volume of DIBP used in this OES, EPA developed an estimate based on CDR reporting threshold; however, there is uncertainty as to whether this estimate accurately reflects the true volume of DIBP used in laboratory chemicals.
Plastics compounding	EPA modeled releases to the environment using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding, which has a medium data quality rating from the systematic review process (U.S. EPA, 2021e). The Agency used DIBP-specific data on concentrations in different DIBP-containing plastic products and additive throughputs in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS are generic for all types of plastic compounding sites, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that compound DIBP into plastic resin. In addition, EPA lacks DIBP-specific facility production volume data and number of compounding sites; therefore, the Agency based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Plastics converting	EPA assessed releases to the environment using the Generic Scenario for the Use of Additives in Plastic Converting, which has a medium data quality rating from the systematic review process (U.S. EPA, 2021f). Because the default values in the GS are generic for all types of thermoplastics converting sites and processes, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that convert DIBP-containing plastic masterbatch into plastic articles via a variety of methods such as extrusion or calendaring. In addition, EPA lacks DIBP-specific facility production volume data and number of converting sites; therefore, the Agency based PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.

OES	Assessment Approach and Uncertainty in Release Estimates
Recycling	EPA assessed releases to the environment from recycling activities using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding as surrogate to the recycling process. The GS has a medium data quality rating from the systematic review process (U.S. EPA, 2021e). Additionally, the Agency used DIBP-specific data on concentrations in different DIBP-containing plastic products in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. EPA referenced information from ENF Recycling, which has a medium quality rating from the systematic review process (ENF, 2024) to estimate the rate of plastic recycling in the United States and applied it to DIBP plastic market share to define an approximate recycling volume of plastic containing DIBP. Because the default values in the GS are generic, there is uncertainty in the representativeness of real-world sites that recycle plastic products containing DIBP. In addition, EPA lacks DIBP-specific plastic recycling rates and facility production volume data; therefore, throughput estimates are based on plastics compounding data and U.S. plastic recycling rates, which are not specific to DIBP.
Waste handling, treatment, and disposal	Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred are generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities. Therefore, they may include amounts received at dedicated waste treatment/disposal sites.
Rubber manufacturing	EPA assessed releases to the environment using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e) and Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f), both of which have a medium data quality rating from the systematic review process. The Agency used DIBP-specific data on concentrations in different DIBP-containing rubber products in the analysis to provide more accurate estimates than the generic values provided by the GSs. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). Because the default values in the GSs are generic for all types of plastic compounding and rubber manufacturing sites and the DIBP-specific concentration data was only for rubber products there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that compound DIBP into rubber material. In addition, EPA lacks DIBP-specific facility production volume data and number of compounding sites; therefore, throughput estimates are based on CDR, which has a reporting threshold of 25,000 lb (11,340 kg) (<i>i.e.</i>, not all potential sites represented) and a magnitude-different low and high range of estimated annual DIBP production. The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions adding some uncertainty to estimated releases.

3.3 Summary of Concentrations of DIBP in the Environment

Based off the environmental release assessment summarized in Section 3.2 and presented in EPA's *Draft Environmental Release and Occupational Exposure Assessment for Phthalate (DIBP)* ([U.S. EPA, 2025t](#)), DIBP is expected to be released to the environment via air, water, biosolids, and disposal to landfills. Environmental media concentrations were quantified in ambient air, soil from ambient air deposition, surface water, and sediment. Additional analysis of surface water used as drinking water was conducted for the human health risk assessment (Section 4.1.3). Given the physical and chemical properties and fate parameters of DIBP (Section 2), concentrations of DIBP in soil and groundwater due to both application of biosolids to land and disposal to landfills are only discussed qualitatively.

EPA relied on its fate assessment to determine which environmental pathways to consider for its screening level analysis of environmental exposure and general population exposure. Details on the environmental partitioning and media assessment can be found in *Draft Fate Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025z](#)). Briefly, based on DIBP's fate parameters, EPA anticipated DIBP to be predominantly in water, soil, and sediment. Soil concentrations of DIBP from land applications were not quantitatively assessed in the screening level analysis as DIBP was expected to have limited persistence potential and mobility in soils receiving biosolids. To contrast, EPA has greater confidence in quantifying DIBP concentrations in soil resulting from air to soil deposition since it is direct deposition into soil rather than mobility within soil (as with biosolids). Therefore, the Agency quantified air to soil deposition with a screening level approach for the purpose of the environmental exposure assessment.

Details on the screening level assessments of each environmental pathway can be found in EPA's *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). Screening level analyses were used for this assessment because of limited reasonably available environmental monitoring data and lack of location data for DIBP releases. Generally, EPA began each quantitative screening level analysis for environmental and general population exposure assessment using the highest modeled environmental media concentrations for the environmental pathways expected to be of greatest concern. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* ([U.S. EPA, 2019c](#)). Additional details of the screening level approaches used for general population exposure is discussed in 4.1.3. If any pathways were identified as a pathway of concern for the general population or the environment, further exposure assessments for that pathway would be conducted to include higher tiers of modeling when available, refinement of exposure estimates, and exposure estimates for additional subpopulations and OES/COUs.

EPA began its environmental and general population exposure assessment with a screening level approach using high-end environmental media concentrations for the environmental pathways expected to be of greatest concern. The high-end environmental media concentrations were estimated using the release estimates for an OES that, when combined with conservative assumptions of environmental conditions, resulted in the greatest modeled concentration of DIBP in a given environmental media. Therefore, EPA did not estimate environmental concentrations of DIBP resulting from all OES presented in Table 3-1.

The OESs resulting in the highest environmental concentration of DIBP are shown in Table 3-8. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* ([U.S. EPA, 2019c](#)). Table 3-8 also indicates whether the highest estimate was used for environmental exposure assessment or general population exposure assessment.

For the water pathway, different hydrological flow rates were used for the different screening level exposure scenarios. The 30Q5² flows (lowest 30-day average flow that occurs in a 5-year period) are used to estimate acute, incidental human exposure through swimming or recreational contact and acute drinking water exposure. The harmonic mean³ flows provide a more conservative estimate as compared to annual average flows and are therefore preferred for assessing potential chronic human exposure via drinking water. The harmonic mean is also used for estimating human exposure through fish ingestion because it takes time for chemical concentrations to accumulate in fish. Lastly, for aquatic or ecological exposure, a 7Q10⁴ flow (lowest 7-day average flow that occurs in a 10-year period) is used to estimate exceedances of concentrations of concern for aquatic life ([U.S. EPA, 2007b](#)). In lieu of facility-specific receiving water body information for DIBP, flow statistics were drawn from a generic distribution of receiving water body flow rates derived from receiving water bodies listed on NPDES permits for facilities with relevant NAICS codes, as described in EPA's *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). Due to especially limited information regarding release locations, a single pooled distribution of receiving water bodies was applied across each OES. Although some variation in receiving water body characteristics would be expected across various OES, due to limitations in available data, EPA's pooled approach includes a broad range of hydrologic flow values that is likely to be inclusive of the range of receiving water body flows across each OES.

For the screening level assessment, EPA identified the Plastic compounding OES as yielding the highest water concentrations using a 7Q10, 30Q5, and harmonic mean flow (Table 3-8).⁵ As described in EPA's *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)), the Agency estimated the surface water concentrations for Plastic compounding OES using releases estimated from generic scenarios. Table 3-8 summarizes the highest concentrations of DIBP estimated in different environmental media based on EPA estimated releases to the environment from various OESs associated with COUs.

The maximum EPA estimated daily release value for fugitive and stack releases for DIBP was 8.82 kg/site-day and categorized under the Plastic compounding OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). Because the release type is unknown, under the methodology used, EPA assumed the entire release was either all fugitive or all stack releases and models the entire release as each type. While this assumption captures the highest release of each type possible, it also limits the analysis to exposure from an individual release type since under this assumption modeled concentrations and deposition rates for fugitive and stack releases are not additive as they cannot happen at the same time. Nonetheless, for this screening level analysis, EPA still provides a total exposure and deposition rate from both release types as if they occurred at the same time. This provides a very conservative exposure scenario and an overestimate of ambient concentrations and deposition rates at the evaluated distances, but ensures findings are health protective. Given the very conservative nature of this modeled exposure scenario, if results indicate the total exposure or deposition rate do not indicate an exposure or risk concern, no further analysis is needed because lower releases would be expected to result in lower

² 30Q5 is defined as 30 consecutive days of lowest flow over a 5-year period. These flows are used to determine acute human exposures via drinking water ([Versar, 2014](#)).

³ Harmonic mean is defined as the inverse mean of reciprocal daily arithmetic mean flow values. These flows represent a long-term average and are used to generate estimates of chronic human exposures via drinking water and fish ingestion.

⁴ 7Q10 is defined as 7 consecutive days of lowest flow over a 10-year period. These flows are used to calculate estimates of chronic surface water concentrations to compare with the COCs for aquatic life ([Versar, 2014](#)).

⁵ 7Q10 and 30Q5 are the lowest 7-day average flow that occurs (on average) once every 10 years and the lowest 30-day average flow that occurs (on average) once every 5 years, respectively.

exposures and lower associated risks. If results indicated an exposure or risk concern, EPA would conduct a refined analysis using a more representative and real exposure scenario (*e.g.*, only determine exposures and derive risk estimates based on a single release type).

Table 3-8. Summary of High-End DIBP Concentrations in Various Environmental Media from Environmental Releases

OES ^a	Release Media	Environmental Media	DIBP Conc.	Environmental or General Population
Plastic compounding <i>without wastewater treatment</i>	Water	Total water column (7Q10, P50 flow)	228 µg/L	Environmental risk assessment
		Total water column (7Q10, P75 flow)	13.3 µg/L	Environmental risk assessment
		Total water column (7Q10, P90 flow)	0.79 µg/L	Environmental risk assessment
		Median 7Q10 P50 (benthic sediment)	9,760 µg/kg	Environmental risk assessment
Plastic compounding <i>with wastewater treatment</i>	Water	Total water column (7Q10, P50 flow)	73.0 µg/L	Environmental risk assessment
		Total water column (7Q10, P75 flow)	4.26 µg/L	Environmental risk assessment
		Total water column (7Q10, P90 flow)	0.25 µg/L	Environmental risk assessment
Plastic compounding <i>without wastewater treatment</i>	Water	Surface water (30Q5, median flow)	174 µg/L	General population
		Surface water (harmonic mean, median flow)	121 µg/L	General population
Plastic compounding <i>with wastewater treatment</i>	Water	Surface water (30Q5, median flow)	55.7 µg/L	General population
		Surface water (harmonic mean, median flow)	38.7 µg/L	General population
Plastic compounding (fugitive and stack)	Ambient air	Daily-averaged total (fugitive and stack, 100 m)	17.59 µg/m ³	General population
		Annual-averaged total (fugitive and stack, 100 m)	16.45µg/m ³	General population
7Q10 = lowest 7-day average flow that occurs (on average) once every 10 years; 30Q5 = lowest 30-day average flow that occurs (on average) once every 5 years; OES = occupational exposure scenario				
^a Table 3-1 provides the crosswalk of OES to COUs.				

3.3.1 Weight of Scientific Evidence Conclusions

Detailed discussion of the strengths, limitations, and sources of uncertainty for modeled environmental media concentration leading to a weight of scientific evidence conclusion can be found in EPA's *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025s)*. However, the weight of scientific evidence conclusion is summarized below for the modeled concentrations for surface water and ambient air.

For the screening level assessment, EPA used the release estimates presented in Table 3-6 to model DIBP concentrations in different environmental media. EPA considers additional variables when considering the weight of scientific evidence for its estimation of environmental media concentrations. Some additional considerations include the use of an additional model (*e.g.*, PSC, IIOAC, etc.) using the release as an input, the applicability of the release data to the environmental media being considered, likelihood of an occurrence of a release to the specific environmental compartment, and available monitoring data.

3.3.1.1 Surface Water

Due to the lack of reported release data and lack of reasonably available information for facilities discharging DIBP to surface waters, the high-end, EPA estimated releases for each COU were applied for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant North American Industry Classification System (NAICS) codes and that had National Pollutant Discharge Elimination System (NPDES) permits.

For the screening level assessment, EPA utilized releases associated with the Plastic compounding OES as it resulted in the highest surface water concentrations for use in environmental risk and general population risk, respectively. EPA determined the surface water concentration associated with this OES represented a conservative high-end exposure scenario and was appropriate to use in its screening-level assessment to assess all other OESs and their associated COUs.

EPA utilized daily release information as an input to the Variable Volume Water Model with Point Source Calculator Tool (VVWM-PSC) Model to estimate surface water concentrations for use in general population and environmental exposure assessment. As mentioned in Section 3.2, EPA estimated a range for daily releases for each OES. For the Fabrication and final use of products or articles, the Agency was not able to estimate releases, but EPA does not expect them to be greater than releases associated with the Plastic compounding OES. The Agency also did not estimate releases from the Waste handling, treatment and disposal OES. Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred is generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities, so EPA assumed that releases are captured in the upstream OESs. For the screening level assessment, the Agency used the release estimates presented in Table 3-6 to model DIBP concentrations in different environmental media.

For DIBP, daily releases for each OES were estimated using generic scenarios. Table 3-7 summarized EPA's overall weight of scientific evidence conclusions for its DIBP release estimate for each OES. Overall EPA concluded the weight of scientific conclusion was slight to moderate for releases that use GSs/ESDs.

As shown in Table 3-6 daily releases to water for each OES were reported to the following categories for DIBP:

- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment)
- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill
- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment), or landfill
- Fugitive air, wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill

Only the discharge type categorized as Wastewater to onsite treatment, discharge to POTW (with or without pretreatment) is known to be discharged only to water. For the other categories categorized as releasing to multiple media types, EPA could not differentiate the proportion of DIBP released only to surface water. For these generic scenario OESs, there was insufficient data to quantify estimated releases specifically to surface water unless releases only to surface water were also estimated for that OES. The Plastic compounding OES, which was utilized for screening, had releases associated with multiple media types (Wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill), but also had releases categorized specifically to water

(wastewater to onsite treatment, discharge to POTW [with or without pretreatment]). Therefore, EPA estimated surface water concentrations for Plastic compounding OES using the releases categorized specifically to water and did not consider the releases associated with the multiple media types. For all other OESs with estimated releases only to multiple media types, estimated surface water concentrations were lower than the surface water concentration estimated for Plastic compounding, which was used as the high-end estimate for screening analysis.

Table 3-9 below identifies the data available for use in modeling surface water concentrations for each OES, and EPA's confidence in the estimated surface water concentrations used for exposure assessment. In considering the various OESs for use in a screening assessment, EPA identified Plastic compounding OES for use in environmental exposure and general population exposure, respectively. EPA determined this OES as most appropriate for use in screening as it resulted in a high-end surface water concentration based on many conservative assumptions, such as the assumption that there is no removal of DIBP prior to release in surface water. Based on the slight and moderate confidence in the release estimates as shown in Table 3-6 and due to the lower flow rates selected from the generated distributions, coupled with high-end release scenarios and no assumptions of treatment, EPA has slight to moderate confidence in the precision of the modeled concentrations with a bias toward over-estimation. The Agency has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation, which represent an upper bound due to the conservative assumptions used. Other model inputs were derived from reasonably available literature collected and evaluated through EPA's systematic review process for TSCA risk evaluations. All monitoring and experimental data included in this analysis were from articles rated as medium- or high-quality from this process. The high-end modeled concentrations in the surface water and sediment exceeded the highest values available from monitoring studies by more than an order of magnitude. This confirms EPA's expectation that modeled concentrations for DIBP presented in this draft risk evaluation are biased toward overestimation and are appropriate to be used as a screening evaluation.

Overall, EPA has robust confidence that the high-end estimated surface water concentration modeled using the Plastic compounding OES is appropriate to use in its screening level assessment to assess all other OESs and their associated COUs—including OESs and COUs with releases that could not be quantified. Risk to the general population and the environment from surface water concentrations are described in Section 4.1.3 and 5.3.2, respectively.

Table 3-9. DIBP Release Data Used for Modeling Surface Water Concentrations

OES	Water Release Data Type	Description of Analysis
Plastic compounding	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release. Because releases associated with this OES yielded the highest surface water concentrations, EPA used this OES for its screening assessment to be applied across other OES. The Agency has slight to moderate confidence in the value of the surface water concentrations modeled for this OES but robust confidence that the use of the high-end surface water concentration is appropriate for a screening assessment.
Plastic converting	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release

OES	Water Release Data Type	Description of Analysis
		data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Incorporation into adhesives and sealants	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Incorporation into paints and coatings	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Rubber manufacturing – compounding	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Rubber manufacturing – converting	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Manufacturing	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Recycling	Generic Scenario (water-specific)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Sufficient release data were available to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.

OES	Water Release Data Type	Description of Analysis
Use as a catalyst – formulation into pre-catalyst	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Repackaging into large and small containers	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Use as a catalyst – intermediate in polypropylene manufacturing	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Application of paints and coatings	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.
Application of adhesives and sealants	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.

OES	Water Release Data Type	Description of Analysis
Use of laboratory chemicals – solids and liquids	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA concluded that there was insufficient release data precision to calculate a surface water concentration based on the release data. However, the range of estimated concentrations are below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.

3.3.1.2 Ambient Air

EPA used the IIOAC Model, previously peer-reviewed methodology for fenceline communities ([U.S. EPA, 2022b](#)) and integrated recommendations from that and other peer-reviews to evaluate exposures and deposition rates via the ambient air pathway for this assessment. The IIOAC Model was developed based on a series of pre-run scenarios within AERMOD (the Agency’s regulatory model) which gives EPA greater confidence in the IIOAC results. However, since results from IIOAC are based on the pre-run AERMOD scenarios, IIOAC modeling is limited to the parameters (*e.g.*, stack parameters, meteorological data, and other factors) used as inputs to those pre-run AERMOD scenarios. The screening level analyses presented in this assessment, IIOAC provides reliable and reproduceable results which can be used to characterize upper-bound exposures and derive screening level risk estimates, giving EPA moderate confidence in the results and findings.

DIBP did not have any reported releases in the databases EPA typically relies upon for facility reported release data (*e.g.*, TRI or NEI). Therefore, the screening level analysis for ambient air for DIBP relied upon EPA-estimated releases and uses the maximum EPA-estimated daily releases of DIBP across all OES/COUs as direct inputs to the IIOAC Model to estimate ambient concentrations of DIBP. The EPA-estimated releases are based on a series of conservative assumptions, production volumes, durations, and other factors that may overestimate the releases modeled. To determine daily releases, the Agency uses the EPA estimated annual release data and number of operating days to calculate daily average releases used for modeling. This approach assumes operations are continuous and releases are the same for each day of operation.

Taken together, the calculation of daily average releases and assumption releases are the same for each day of operation may underestimate short-term or daily exposure and deposition rates because these estimates may miss actual short-term peak releases (and associated exposures) if higher or lower releases occur on different days due to changes in operation or other factors. This gives the Agency lower confidence the EPA-estimated releases are representative. However, the use of conservative assumptions when estimating releases and the use of the maximum EPA-estimated release across all OES/COUs as direct inputs to the IIOAC Model to estimate ambient concentrations gives the agency moderate confidence that high-end releases are not missed. EPA Overall, EPA has moderate confidence that the releases and estimated air concentrations and deposition rates are appropriate and health protective for a screening level analysis. The uncertainties associated with the EPA-estimated release data used for this screening level assessment are detailed in the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)) and carry over to the ambient air exposure assessment.

The maximum EPA-estimated daily release value used for the ambient air assessment was categorized under the Plastic compounding OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). As described in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)), since the release type is unknown EPA assumed the entire release was either entirely fugitive or entirely stack release and models each release type separately. Under this assumption, the modeled concentrations and deposition rates attributable to either all fugitive or all stack releases are not additive and do not align temporally as they cannot happen at the same time. Nonetheless, EPA still provides a total exposure and deposition rate from both release types assuming they occurred at the same time for this screening level assessment. This assumption results in a very conservative “total exposure” to DIBP, ensures possible exposures are not missed, and retains health protective exposure and associated risks estimates. Given these assumptions, the Agency has slight confidence in the exposure scenario modeled (cannot occur at the same time under the assumptions modeled) and recognizes results are likely overestimates of ambient concentrations and deposition rates at the evaluated distances.

Due to the conservative assumptions made along with the use of the highest release estimates and the combination of modeled concentrations for fugitive and stack release types even though they do not align temporally and cannot happen at the same time, EPA has robust confidence the modeled ambient air concentrations and deposition rates are appropriately conservative to use for a screening level analysis for all OESs and associated COUs. Risk to the general population from ambient air concentrations are described in Section 4.1.3 and Section 4.3.4.

1271 **4 HUMAN HEALTH RISK ASSESSMENT**

**DIBP – Human Health Risk Assessment (Section 4):
Key Points**

EPA evaluated all reasonably available information to support human health risk characterization of DIBP for workers, ONUs, consumers, bystanders, and the general population, including PESS. Exposures to workers, ONUs, consumers, bystanders, and the general population are described in Section 4.1. Human health hazards are described in Section 4.2; human health risk characterization is described in Section 4.3.

Exposure Key Points

- EPA assessed inhalation and dermal exposures for workers and ONUs, as appropriate, for each COU (Section 4.1.1). Both dermal and inhalation were primary routes of exposure, depending on the OES.
- EPA assessed inhalation, dermal, and oral exposures for consumers and bystanders, as appropriate, for each COU (Section 4.1.2) in scenarios that represent a range of use patterns and behaviors. The primary route of exposure was dermal for most products.
- EPA assessed inhalation, oral, and dermal exposures for the general population, as appropriate, via surface water, drinking water, ambient air, and fish ingestion for tribal populations. The Agency determined that all exposures assessed for the general population were not of concern (Sections 4.1.3 and 4.3.4).
- EPA assessed non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP for the U.S. civilian population using National Health and Nutrition Examination Survey (NHANES) urinary biomonitoring data and reverse dosimetry (Section 4.4.2).

Hazard Key Points

- EPA identified effects on the developing male reproductive system as the most sensitive and robust non-cancer hazard associated with oral exposure to DIBP in experimental animal models (Section 4.2).
- A non-cancer point of departure (POD) of 5.7 mg/kg-day was selected to characterize non-cancer risks for acute, intermediate, and chronic durations of exposure. A total uncertainty factor (UF) of 30 was selected for use as the benchmark margin of exposure (MOE).
- EPA derived draft relative potency factors (RPFs) based on a common hazard endpoint (*i.e.*, reduced fetal testicular testosterone). Draft RPFs were derived via meta-analysis and benchmark dose (BMD) modeling (Section 4.4.1). Given its limited toxicological dataset, scaling by the RPF and application of the index chemical POD provides a more sensitive and robust dose-response assessment than the DIBP-specific point of departure POD.

Risk Assessment Key Points

- Inhalation exposure drive acute non-cancer risks to workers in occupational settings (Section 4.3.2).
- Dermal and inhalation exposures drive acute non-cancer risks to consumers (Section 4.3.3).
- No potential non-cancer risk was identified for the general population (Section 4.3.4).
- EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis supporting this draft risk evaluation (Section 4.3.5).
- EPA considered cumulative risk to workers and consumers through exposure to DIBP from individual COUs in combination with cumulative non-attributable national exposure to DEHP, DBP, BBP, DIBP, and DINP as estimated from NHANES biomonitoring data (Sections 4.4.4 and 4.4.5).

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4.1 Summary of Human Exposures

4.1.1 Occupational Exposures

The following subsections describe EPA's approach to the assessment of occupational exposures, summarize the weight of scientific evidence conclusions, and provide exposure assessment results for each OES. EPA assessed exposures that result from the manufacturing, processing, use, and disposal of DIBP. The Agency assessed the exposure of two occupational exposure groups, which are workers and ONUs. Workers work in close proximity to DIBP and may handle DIBP while ONUs do not directly handle DIBP but may be indirectly exposed to it as part of their employment. The Agency evaluated the following exposures: inhalation exposure of workers and ONUs to vapor, mist and dust, dermal exposure of workers to liquid and solids, and dermal exposure of ONUs to mist and dust that deposits on surfaces.

Table 4-1 summarizes the number of facilities and total number of exposed workers for all OESs. For scenarios in which the results are expressed as a range, the lower end of the range is based on the 50th percentile estimate of the number of sites and the upper end of the range is based on the 95th percentile estimate of the number of sites. More information on the method used to estimate the number of workers and ONUs can be found in Section 2 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)).

Table 4-1. Summary of Total Number of Workers and ONUs Potentially Exposed to DIBP for Each OES

Occupational Exposure Scenario (OES)	Total Exposed Workers	Total Exposed ONUs	Number of Facilities	Notes
Manufacturing	22	9	1	Number of workers and ONU estimates based on Bureau of Labor Statistics (BLS) and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on identified sites from CDR.
Repackaging	1–4	1–2	1 (central tendency); 4 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Incorporation into paints and coatings	14–28	5–10	1 (central tendency); 2 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Incorporation into adhesives and sealants	18	7	1	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.

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Occupational Exposure Scenario (OES)	Total Exposed Workers	Total Exposed ONUs	Number of Facilities	Notes
Use as a catalyst	66–110	27–45	3 (central tendency); 5 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Application of adhesives and sealants	270–864	85–272	5 (central tendency); 16 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Application of paints and coatings	72–336	36 (central tendency); 168 (high-end)	6 (central tendency); 28 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Use of laboratory chemicals – liquid	20–202	80–808	20 (central tendency); 202 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Use of laboratory chemicals – solid	36,873	147,492	36,873	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Plastics compounding	135–243	60–108	5 (central tendency); 9 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Plastics converting	684–1,206	335–190	38 (central tendency); 67 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Fabrication of final products from articles	N/A			Number of sites data was unavailable for this OES.

Occupational Exposure Scenario (OES)	Total Exposed Workers	Total Exposed ONUs	Number of Facilities	Notes
Recycling and disposal	354	236	59	Number of workers and ONU estimates based on the BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on industry data (ENF, 2024).
Rubber manufacturing	33	9	1	Number of workers and ONU estimates based on the BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on identified sites from CDR.
Manufacture of polyurethane foam for pipeline pigs	15	4	1	Number of workers and ONU estimates based on the BLS and U.S. Census Bureau data (U.S. BLS, 2023 ; U.S. Census Bureau, 2015). Number of facilities estimate based on industry data (CBI).
^a The central tendency estimate for total exposed ONUs in the Repackaging OES was <0.5, which was rounded up to a minimum of 1. ^b When the number of facilities was estimated from monte carlo simulation, the 50th percentile was the CT and 95th percentile was the HE. The number of workers and ONUs were obtained by multiplying the workers and ONUs for relevant NAICS codes with the number of facilities estimates (CT and HE for ranges).				

4.1.1.1 Assessment Approach and Weight of Scientific Evidence Conclusions

As discussed in Section 3.1.1.1, EPA developed OESs to assess exposures that potentially result from the COUs, and Table 3-1 provides a crosswalk between COUs and OESs. The Agency did not find any reasonably available DIBP occupational exposure monitoring data nor any data about processes and operations at actual sites associated with DIBP other than CDR data and therefore assessed occupational exposure in the case of all OESs via mathematical modeling. This approach involves the assessment of the occupational exposures to DIBP that result from the worker activities that occur at the generic site of each OES. The following is a summary of all of the possible worker activities that EPA determined: unloading, cleaning of transport containers, sampling, equipment cleaning, changing filter media, packaging, product use and product disposal. The specific worker activities in the case of each OES and the corresponding exposure routes and physical forms of DIBP that workers are exposed to (i.e., vapor, mist, dust, liquid, and/or solid) are stated in Section 3 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)). EPA estimated the DIBP inhalation exposure concentrations and the DIBP dermal acute potential dose rates (APDR) that potentially result from these workers activities via mathematical modeling.

EPA calculated worker inhalation exposure concentrations in accordance with three inhalation exposure models. (1) the EPA Mass Balance Inhalation Model in the case of exposure to DIBP vapor, (2) the Generic Model for Central Tendency and High-End Inhalation Exposure to Total and Respirable Particulates Not Otherwise Regulated (PNOR Model) ([U.S. EPA, 2021d](#)) in the case of exposure to dust that contains DIBP, and (3) the Automotive Refinishing Spray Coating Mist Inhalation Model ([OECD, 2011a](#)) in the case of exposure to mist that contains DIBP. The EPA Mass Balance Inhalation Model is a one box model. The generation rate of the chemical substance is the input variable of this model. EPA equated generation rates to the pertinent DIBP vapor release rates that the Agency calculated as part of

the assessment of DIBP releases to the environment; these are the DIBP vapor release rates that are related to the assessed worker activities. The Agency conducted Monte Carlo simulation to calculate DIBP vapor inhalation exposure concentrations in accordance with The EPA Mass Balance Inhalation Model. The other two models mentioned above are models that incorporate surrogate inhalation exposure monitoring data and exposure concentrations were calculated without conducting Monte Carlo simulation. In the case of the PNOR Model, the surrogate data are respirable dust inhalation exposure concentrations that are derived from OSHA CEHD data ([OSHA, 2020](#)). In the case of the Automotive Refinishing Spray Coating Mist Inhalation Model, the surrogate data are inhalation exposure concentrations of mist that workers are potentially exposed to during spray painting at auto refinishing shops.

Systematic review by EPA resulted in empirical dermal absorption data pertaining to dermal absorption of neat DIBP. The Agency calculated a DIBP dermal absorption flux from these data and assessed dermal exposure from this flux value. EPA assessed high-end and central tendency inhalation and dermal exposures of workers and ONUs in the case of each OES. The inhalation exposure estimation methods described above are not methods for the evaluation of ONU exposures; therefore, EPA assumed that worker central tendency inhalation exposure values were representative of ONU inhalation exposures. The *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)) provides additional details on the development of approaches and the exposure assessment results.

EPA evaluated the quality of the models and data sources using the data quality review evaluation metrics and the rating criteria described in the Draft Systematic Review Protocol ([U.S. EPA, 2021b](#)). The Agency assigned an overall quality level of high, medium, or low to the relevant data. In addition, EPA established an overall confidence level for the data when integrated into the occupational exposure assessment. The Agency also considered the assessment approach, the quality of the data and models, and uncertainties in assessment results to assign an overall weight of scientific evidence rating of robust, moderate, or slight.

For inhalation and dermal exposure routes, EPA provided occupational exposure results representative of central tendency and high-end exposure conditions. The central tendency is expected to represent occupational exposures in the center of the distribution for a given COU. For this draft risk evaluation, EPA used the 50th percentile (median), mean (arithmetic or geometric), mode, or midpoint values of a distribution as representative of the central tendency scenario. Although the Agency preferred to provide the 50th percentile of the distribution, if the full distribution was unknown, EPA may assume that the mean, mode, or midpoint of the distribution represents the central tendency, depending on the statistics available for the distribution. The high-end exposure is expected to be representative of occupational exposures that occur at probabilities above the 90th percentile but below the highest exposure for any individual ([U.S. EPA, 1992](#)). For risk evaluation, EPA provided high-end results at the 95th percentile. If the 95th percentile was not reasonably available, the Agency used a different percentile greater than or equal to the 90th percentile but less than or equal to the 99th percentile, depending on the statistics available for the distribution. If the full distribution was not known and the preferred statistics were not reasonably available, EPA estimated a maximum or bounding estimate in lieu of the high-end.

Table 4-2 provides EPA's overall confidence rating and whether the Agency used modeling to estimate inhalation and dermal exposures for workers. No monitoring data were reasonably available.

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Table 4-2. Assessment Approach and Weight of Scientific Evidence Conclusions for OESs

OES	Inhalation Exposure				Dermal Exposure			
	Modeling ^a		Weight of Scientific Evidence Conclusion		Modeling ^a		Weight of Scientific Evidence Conclusion	
	Worker	ONU	Worker	ONU	Worker	ONU	Worker	ONU
Manufacturing	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Repackaging into large and small containers	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Incorporation into adhesives and sealants	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Incorporation into paints and coatings	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Use as a catalyst	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Application of paints and coatings	✓	✓	Moderate to Slight	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Application of adhesives and sealants	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Use of laboratory chemicals	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate (liquids) Slight to Moderate (solids)	Slight to Moderate
Fabrication of final products from articles	✓	✓	Moderate	Slight to Moderate	✓	✓	Slight to Moderate	Slight to Moderate
Plastics compounding	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Plastics converting	✓	✓	Moderate	Slight to Moderate	✓	✓	Slight to Moderate	Slight to Moderate
Recycling	✓	✓	Moderate	Slight to Moderate	✓	✓	Slight to Moderate	Slight to Moderate
Waste handling, treatment, and disposal	✓	✓	Moderate	Slight to Moderate	✓	✓	Slight to Moderate	Slight to Moderate
Rubber manufacturing	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Manufacture of polyurethane foam for pipeline pigs	✓	✓	Moderate	Slight to Moderate	✓	✓	Slight to Moderate	Slight to Moderate
ONU = occupation non-user ^a Occupational exposure was assessed via mathematical modeling because worker monitoring data are not reasonably available.								

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4.1.1.2 Summary of Inhalation Exposures

Table 4-3 presents a summary of the inhalation exposure assessment results. This table provides a summary of the 8-hour time weighted average (8-hour TWA) exposure estimates for all routes (*i.e.*, vapor, mist, and particulate), as well as the Acute Dose (AD), the intermediate average daily dose

(IADD), and the average daily dose (ADD) for females of reproductive age. The *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)) provides exposure results for average adult workers and ONUs. This assessment also provides additional details regarding AD, IADD, and ADD calculations along with EPA's approach and methodology for estimating exposures. For OESs where there is potential for vapor inhalation exposures, EPA assessed inhalation exposure to vapor to be equal to the surrogate manufacturing vapor exposure concentrations.

Table 4-3. Summary of Female Workers of Reproductive Age Inhalation Exposure Results for Each OES

OES ^a	Inhalation Estimates (Female Workers of Reproductive Age)							
	All Routes 8-Hour TWA (mg/m ³)		AD (mg/kg/day)		IADD (mg/kg/day)		ADD (mg/kg/day)	
	CT	HE	CT	HE	CT	HE	CT	HE
Manufacturing ^b	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Repackaging into large and small containers ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.1E-04	1.7E-03
Incorporation into adhesives and sealants ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Incorporation into paints and coatings ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Use as catalyst – formation into pre-catalyst ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Use as catalyst – intermediate in polypropylene manufacturing ^d	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Application of paints and coatings – spray application ^e	0.34	22	4.7E-02	3.1	3.4E-02	2.2	3.2E-02	2.1
Application of paints and coatings – non-spray application ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.8E-04	1.7E-03
Application of adhesives and sealants – spray application ^e	2.0	22	0.28	3.1	0.21	2.2	0.18	2.1
Application of adhesives and sealants – non-spray application ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.5E-04	1.7E-03
Use of laboratory chemicals – liquids ^c	4.0E-03	1.8E-02	5.5E-04	2.5E-03	4.1E-04	1.9E-03	3.6E-04	1.7E-03
Use of laboratory chemicals – solids ^f	1.9E-04	2.7E-03	2.6E-05	3.7E-04	1.9E-05	2.7E-04	1.7E-05	2.6E-04
Fabrication of final product from articles ^f	4.0E-02	0.36	1.0E-02	5.0E-02	4.1E-03	3.6E-02	4.0E-03	3.0E-02
Plastics compounding ^d	4.2E-03	2.1E-02	5.8E-04	2.9E-03	4.2E-04	2.1E-03	3.5E-04	2.0E-03
Plastics converting ^d	2.1E-02	0.37	2.9E-03	5.1E-02	2.1E-03	3.7E-02	1.7E-03	3.5E-02
Recycling ^d	5.2E-02	0.72	7.2E-03	9.9E-02	5.3E-03	7.3E-02	4.4E-03	6.8E-02

OES ^a	Inhalation Estimates (Female Workers of Reproductive Age)							
	All Routes 8-Hour TWA (mg/m ³)		AD (mg/kg/day)		IADD (mg/kg/day)		ADD (mg/kg/day)	
	CT	HE	CT	HE	CT	HE	CT	HE
Waste handling, treatment, and disposal ^d	5.2E-02	0.72	7.2E-03	9.9E-02	5.3E-03	7.3E-02	4.4E-03	6.8E-02
Rubber compounding ^d	0.10	1.0	1.4E-02	0.14	1.0E-02	0.10	8.9E-03	9.6E-02
Rubber converting ^d	5.0E-02	0.96	6.9E-03	0.13	5.1E-03	9.7E-02	4.1E-03	9.1E-02
AD = acute dose (8 hours for a single workday); ADD = chronic average daily dose (8 hours per workday for 250 days per year for 31 or 40 working years); CT = central tendency; HE = high-end; IADD = intermediate average daily dose (8 hours per workday for 22 days per 30-day period); OES = occupational exposure scenario; TWA = time-weighted average ^a EPA assessed worker and ONU inhalation exposures in the case of the Manufacture of Polyurethane Foam for Pipeline Pigs OES qualitatively and therefore numerical estimates are not included in this table. The Agency assessed this OES qualitatively by determining that the daily rate of the release of DIBP from each of the various sources of release of this OES is less than the daily rate of the release of DIBP from a corresponding source of release of the Plastics compounding OES, Plastics converting OES, or Rubber manufacturing OES. ^b This OES involves worker inhalation exposure to DIBP vapor only. The inhalation exposure concentrations related to various worker activities were calculated in accordance with the EPA Mass Balance Inhalation Model and then an 8-hour TWA exposure concentration was calculated as a TWA of these concentrations and EPA assessed inhalation exposure concentration to be equal to this 8-hour TWA exposure concentration. ^c These OESs involve worker inhalation exposure to DIBP vapor only. EPA assessed inhalation exposure concentrations in the case of each OES to be equal to the assessed inhalation exposure concentrations of the Manufacturing OES. ^d These OESs involve worker inhalation exposure to DIBP vapor and to dust that contains DIBP. With regard to exposure to DIBP vapor, EPA estimated the inhalation exposure concentrations of all workers associated with these OESs to be equal to the assessed inhalation exposure concentrations of the Manufacturing OES. With regard to exposure to dust that contains DIBP, the Agency estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with the PNOR Model. The Agency then conservatively assumed that all workers of these OESs are exposed to vapor and to dust during a single shift and assessed inhalation exposure in the case of all OESs by aggregating the estimated DIBP vapor inhalation exposure concentrations and the DIBP dust inhalation exposure concentrations. ^e These OESs involve worker inhalation exposure to mist that contains DIBP. EPA estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with Automotive Refinishing Spray Coating Mist Inhalation Model. ^f These OESs involve worker inhalation exposure to dust that contains DIBP. EPA estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with the PNOR Model.								

4.1.1.3 Summary of Dermal Exposures

As mentioned in Section 2.4.3 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)), the rate of dermal absorption of DIBP is expected to be limited by aqueous solubility due to its physical-chemical properties (*i.e.*, low water solubility and high octanol-water partition coefficient). Because there were no data available to represent the rate of absorption of DIBP through human skin, EPA selected surrogate data from an *in vitro* dermal absorption study that measured the rate of absorption of a similar compound (*i.e.*, DBP) through human skin ([Scott et al., 1987](#)). DBP and DIBP are isomers with similar physical-chemical properties and similar rates of dermal absorption in live rats ([Elsisi et al., 1989](#)). Further, dermal absorption modeling of DIBP (Section 2.4.3.2 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#))) supports the selection of surrogate dermal absorption data.

The value of absorptive flux (*i.e.*, 7.0×10^{-5} mg/cm²/hr) was measured by Scott *et al.* (1987) using neat liquid DBP, and therefore, the flux value is most applicable to the absorption of liquid materials. It is expected that contact with solid materials will result in a lower rate of dermal absorption than contact with liquid materials due to reduced mobility of molecules that exist within a solid matrix. Therefore, the absorptive flux of 7.0×10^{-5} mg/cm²/hr is most representative of dermal absorption of DIBP from liquid compounds, and this value serves as an upper bound for the dermal absorption of DIBP from solid materials. More specifically, it is expected that absorption of DIBP from solid materials will not exceed the rate of absorption of DIBP from liquid materials.

Table 4-4 provides the occupational dermal exposure estimates based on the flux measured from the neat material. Because the selected absorptive flux is most representative of dermal absorption of DIBP from liquid compounds, and it is expected that absorption of DIBP from solid materials will not exceed the rate of absorption of DIBP from liquid materials, the values shown in Table 4-4 represent the expected levels of occupational dermal exposure for contact with liquid materials and upper bound estimates for contact with solid materials. Lastly, it is important to note that dermal exposures to ONUs were assessed for scenarios where there may be dust or mist generation since it is possible that an ONU may inadvertently contact a surface that has been contaminated by dust or mist containing DIBP.

Details regarding the calculations of values in Table 4-4 can be found in Appendix C of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025t).

Table 4-4. Summary of Female Workers of Reproductive Age Dermal Exposure Results for Each OES

OES	Dermal Exposure Estimates (Female Workers of Reproductive Age)									
	Exposure Type ^a		APDR ^{b c} (mg/day)		AD ^b (mg/kg/day)		IADD ^b (mg/kg/day)		ADD ^b (mg/kg/day)	
	Liquid	Solid	CT ^d	HE ^d	CT	HE	CT	HE	CT	HE
Manufacturing	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Repackaging into large and small containers	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.0E-03	4.7E-03
Incorporation into adhesives and sealants	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Incorporation into paints and coatings	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Use as a catalyst – formation into pre-catalyst	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Use as a catalyst – intermediate in polypropylene manufacturing	✓	✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Application of paints and coatings – spray application	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03

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OES	Dermal Exposure Estimates (Female Workers of Reproductive Age)									
	Exposure Type ^a		APDR ^{b c} (mg/day)		AD ^b (mg/kg/day)		IADD ^b (mg/kg/day)		ADD ^b (mg/kg/day)	
	Liquid	Solid	CT ^d	HE ^d	CT	HE	CT	HE	CT	HE
Application of paints and coatings – non-spray application	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Application of adhesives and sealants – spray application	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.2E-03	4.7E-03
Application of adhesives and sealants – non-spray application	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.2E-03	4.7E-03
Use of laboratory chemicals – liquids	✓		0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.2E-03	4.7E-03
Use of laboratory chemicals – solids		✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.2E-03	4.7E-03
Fabrication of final product from articles		✓	0.25	0.30	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.4E-03	4.7E-03
Plastics compounding	✓	✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.1E-03	4.7E-03
Plastics converting		✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.1E-03	4.7E-03
Recycling		✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.1E-03	4.7E-03
Waste handling, treatment, and disposal		✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.1E-03	4.7E-03
Rubber compounding	✓	✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.2E-03	4.7E-03
Rubber converting		✓	0.25	0.50	3.4E-03	6.9E-03	2.5E-03	5.0E-03	2.1E-03	4.7E-03

OES	Dermal Exposure Estimates (Female Workers of Reproductive Age)									
	Exposure Type ^a		APDR ^{b c} (mg/day)		AD ^b (mg/kg/day)		IADD ^b (mg/kg/day)		ADD ^b (mg/kg/day)	
	Liquid	Solid	CT ^d	HE ^d	CT	HE	CT	HE	CT	HE
^a OESs include dermal exposures to liquids (<i>i.e.</i> , neat DIBP and/or liquid solutions containing DIBP), dermal exposures to solids (<i>i.e.</i> , particles or articles that contain DIBP), or dermal exposure to both liquids and solids as indicated in this column. ^b APDR = acute potential dose rate, AD = acute dose, IADD = intermediate average daily dose, ADD = average daily dose ^c EPA calculated APDR in the case of exposures to liquids and solids from the following parameters as discussed in Section 4.1.1.4: DIBP dermal absorption flux, surface area, and exposure duration. ^d For high-end estimates of workers, EPA assumed the exposure surface area was equivalent to mean values for two-hand surface area (<i>i.e.</i> , 1,070 cm ² for male workers and 890 cm ² for female workers) (U.S. EPA, 2011a). For central tendency estimates of workers, EPA assumed the exposure surface area was equivalent to only a single hand (or one side of two hands) and used half the mean values for two-hand surface areas (<i>i.e.</i> , 535 cm ² for male workers and 445 cm ² for female workers). For high-end estimates of ONUs, EPA assumed the exposure surface area was equivalent to mean value for two palms of adult males (<i>i.e.</i> , 535 cm ²). For central tendency estimates of ONUs, EPA assumed the exposure surface area was equivalent to the mean value for one palm of an adult male (<i>i.e.</i> , 268 cm ²). An absorptive flux of 7.0×10 ⁻⁵ mg/cm ² /hr (Scott et al., 1987) and a duration of absorption of 8 hours (U.S. EPA, 1991) were used for estimating both central tendency and high-end exposures for workers and ONUs. EPA assumed a BW of 80 kg for average adult workers and a BW of 72.4 kg for females of reproductive age, per Chapter 8 of the Exposure Factors Handbook (U.S. EPA, 2011a). For both high-end and central tendency estimates, averaging time for intermediate dermal exposures was assumed as 22 days out of 30 days. For high-end estimates, averaging time for chronic non-cancer dermal exposures was assumed as 250 days out of 365 days. For central tendency estimates, averaging time for chronic non-cancer dermal exposures varied per OES, ranging from 208 to 250 days out of 365 days over the number of working years.										

4.1.1.4 Assessment Methodology and Discussion of the Weight of Scientific Evidence

This section contains summaries of the occupational exposure assessment methodologies of the various OESs in Table 4-5; complete descriptions of these methodologies are provided in the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)). This section also contains discussions of the weight of scientific evidence in the case of the various OESs. EPA determined the weight of scientific evidence in accordance with the Draft Systematic Review Protocol ([U.S. EPA, 2021b](#)). Judgment on the weight of scientific evidence is based on the strengths, limitations, and uncertainties associated with the exposure estimates. The Agency considers factors that increase or decrease the strength of the evidence supporting the exposure estimate. Factors that increase or decrease the strength of evidence are given in Table 7-6 of the Draft Systematic Review Protocol ([U.S. EPA, 2021b](#)) and Table 7-7 of this reference provides example judgements. The best professional judgment about the weight of scientific evidence is summarized using the descriptors of robust, moderate, slight, or indeterminate ([U.S. EPA, 2021b](#)).

A strength associated with the DIBP occupational exposure estimates in this assessment is that worker body weight, which is an exposure factor of inhalation and dermal exposure, and worker breathing rate, which is an exposure factor of inhalation exposure, were informed by moderate to robust data sources. An uncertainty that is associated with the exposure estimates in general is the assessment of inhalation exposure of ONUs. EPA assumed that worker central tendency exposure values were representative of ONU exposures. In reality, exposures for ONUs can vary substantially and exposure levels may be variable based on the amount of time spent in proximity to the chemical. Another uncertainty that is associated with the DIBP occupational exposure estimates in general is that EPA calculated ADD values assuming that workers and ONUs are regularly exposed during their entire working lifetime, which likely results in an overestimate. For example, individuals may change jobs during the course of their career such that they are no longer exposed to DIBP, and the actual ADD values become lower than the estimates presented. Table 4-5 contains discussions of overall weight of scientific evidence for DIBP exposure assessments for each OES.

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Table 4-5. Summary of Assessment Methodology and Discussion of the Weight of Scientific Evidence by OES

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Manufacturing	<i>Summary of the Assessment Method</i> EPA assessed inhalation exposure of workers resulting from DIBP fugitive emissions, which are vapor emissions only, that occur during DIBP manufacturing. EPA determined the sources of these fugitive emissions based on the ESD on the Chemical Industry (OECD, 2011c), and these sources are associated with the following worker activities: product sampling, equipment cleaning and loading of DIBP into transport containers. The Agency calculated the concentration of DIBP vapor that workers are potentially exposed to via inhalation in the case of each of these worker activities in accordance with the EPA Mass Balance Inhalation Model. The DIBP vapor release rate is the input variable of this model, and EPA calculated the rate of release of DIBP vapor from each of the above-mentioned release sources as a probability distribution as part of the assessment of DIBP releases that is discussed Section 3. EPA also determined the values of two of the model parameters, which are the ventilation rate and the mixing factor, as probability distributions because of uncertainty about the values of these model parameters. The agency incorporated via Monte Carlo simulation all of the above-mentioned probability distributions into the calculation of exposure concentrations and calculated these concentrations as probability distributions. The Agency then assumed all of the 3 worker activities are done by the same worker during a single 8-hour shift and calculated an 8-hour TWA exposure concentration as a time-weighted average of the 3 calculated concentrations. This time-weighted average concentration was calculated from the exposure durations of the 3 worker activities and these exposure durations were equated to the durations of release from each of the release sources which were determined as part of the assessment of DIBP releases that is discussed in Section 3. This 8-hour TWA concentration was calculated as a probability distribution and EPA assessed the inhalation exposure concentration of the manufacturing OES to be equal to this concentration probability distribution. The Agency assessed both the central tendency and high-end exposure frequencies to be equal to the number of operating days, which EPA estimated as a discrete value of 250 days per year in accordance with EPA's typical assumption related to the number of operating days of lower-PV specialty chemicals. Appendix D.2 and Appendix D.14 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t) contains detailed information about the releases and occupational exposure models of the manufacturing OES, respectively. <i>Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates</i> The strengths of the exposure estimates are as follows: (1) the overall quality rating of the ESD on the Chemical Industry (OECD, 2011c) is medium, (2) with regard to the exposure scenario, the assessed worker activities are frequently occurring activities of chemical industry workers and are pertinent in the case of the OES, (3) the EPA Mass Balance Inhalation Model is well described and the underlying scientific and computational basis of this model is robust, (4) all data that the Agency used to inform the modeling parameter distributions have overall data quality ratings of either high or medium, and (5) exposure concentrations were calculated via Monte Carlo simulation from model input data that are variable. Input data variation increases the likelihood that the calculated exposure concentrations encompass the true occupational inhalation exposure concentrations. The major limitation is uncertainty about the calculated fugitive emission rates because of uncertainty about the number of operating days. Another limitation is uncertainty as to the representativeness of the model parameter distributions because these data are not specific to sites that use DIBP. In general, the effects of these uncertainties on the exposure estimates are unknown, as the uncertainties may result in either overestimation or underestimation of exposures depending on the actual distributions of each of the model input parameters. There is

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	uncertainty in in the representativeness of modeled exposures towards the true distribution of potential exposures. These estimates are likely conservative because of the conservative assumption that a single worker does all worker activities during a single shift. Weight of Scientific Evidence Conclusion EPA has moderate confidence in the assessed exposures for average adult workers and females of reproductive age based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths are related to the assessed worker activities, the mathematical model of the assessment calculations, the systematic review overall quality ratings of the values of the parameters of the mathematical model, and the Monte Carlo computations which are related to model input data variation. The limitations are the uncertainties related to the accuracies of the DIBP vapor generation rate and the values of the parameters of the mathematical model. There is uncertainty in the assessed exposures, but these exposures are likely conservative because of the conservative assumption that a single worker does all worker activities during a single shift. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Repackaging Incorporation into adhesives and sealants Incorporation into paints and coatings Use as a catalyst – formulation into pre-catalyst Use of laboratory chemicals – liquids	Summary of the Assessment Method EPA assessed inhalation exposure to vapor to be equal to surrogate manufacturing exposure concentrations. These surrogate exposure concentrations from the manufacturing OES are upper-bound exposures because these concentrations exceed the concentrations that the Agency would have calculated via mathematical modeling in the case of this OES. According to the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t), releases associated with each of the five OESs include DIBP fugitive emissions that are vapor emissions only. EPA did not conduct mathematical modeling involving the rates of these emissions to estimate exposure concentrations because the Agency determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case worker inhalation exposure as discussed in Appendix D.14 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). EPA assumed exposure duration is equal to 8 hours per day in the case of each of these OESs because the surrogate exposure concentrations are 8-hour TWA concentrations. The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 5 OESs are in the range of 208 to 250 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a worker or are equal to the number of operating days that EPA assessed in the case of an OES. In some cases, EPA assessed the central tendency and high-end exposure frequency to be equal. Section 3 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t) contains a complete discussion of the exposure frequencies of each of the OESs. Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates The strength of the exposure estimates is EPA’s high confidence that the surrogate inhalation exposure concentrations are upper-bound exposure estimates for these OESs. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration. Weight of Scientific Evidence Conclusion

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Use as a catalyst – intermediate in polypropylene manufacturing Plastic compounding Plastic converting Rubber manufacturing – rubber compounding Rubber manufacturing – rubber converting Recycling Waste handling, treatment, and disposal	Summary of the Assessment Method Each of these 7 OESs involve fugitive emissions of DIBP vapor, fugitive emissions of dust that contains DIBP and various worker activities that are related to these fugitive emissions as discussed in Section 3 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). In the case of exposure to DIBP vapor, EPA estimated the inhalation exposure concentrations of all workers associated with these OESs to be equal to surrogate exposure concentrations. In the case of exposure to dust that contains DIBP, the Agency estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with PNOR Model. EPA assessed inhalation exposure to vapor to be equal to surrogate manufacturing exposure concentrations. These surrogate exposure concentrations from the manufacturing OES are upper-bound exposures because these concentrations exceed the concentrations that the Agency would have calculated via mathematical modeling in the case of this OES. That is, EPA determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case worker inhalation exposure concentrations as discussed in Appendix D.14 of <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). With regard to inhalation exposure to dust that contains DIBP, EPA calculated inhalation exposure concentrations as the product of the following two factors: (1) central tendency and high-end worker monitoring data that are inhalation exposure concentrations in the case of worker exposure to respirable dust at sites associated with certain NAICS codes and (2) the concentration of DIBP in products. These respirable dust inhalation exposure concentrations are a part of the PNOR Model and are derived from OSHA CEHD data (OSHA, 2020), which was rated high for data quality via systematic review. These are not DIBP worker monitoring data, and the chemical composition of the dust may not have been reported by OSHA. The worker monitoring data of the PNOR Model that are respirable dust inhalation exposure concentrations are classified by NAICS codes. In the case of each of the 7 OESs, EPA selected the monitoring data that are associated with a NAICS code that EPA deemed to be the most appropriate. These NAICS codes are as follows: NAICS code 325 (Chemical Manufacturing) in the cases of use as a catalyst – intermediate in polypropylene manufacturing, plastic compounding, and rubber manufacturing – rubber compounding and converting; NAICS code 326 (Plastics and Rubber Products Manufacturing) in the case of plastic converting; NAICS code 56 (Administrative and Support and Waste Management and Remediation Services) in the case of recycling and waste handling, treatment, and disposal. EPA assessed the mass concentration of DIBP in solid material containing DIBP in the case of each of the 7 OESs to be equal to the following concentration data that were generally rated high for data quality via systematic review: • Use as a catalyst – intermediate in polypropylene manufacturing: the highest expected concentration of DIBP in polypropylene manufacturing based on industry data (W.R. Grace & Co., 2022); • Plastic compounding and Plastic converting: the highest expected concentration of DIBP in plastics based on data about DIBP content in different types of PVC flooring (Danish EPA, 2011); • Rubber manufacturing – rubber converting compounding and Waste handling, treatment, and disposal: industry data reported in the Emission Scenario Document on Additives in Rubber Industry and Generic Scenario on Use of Additives in Plastic Compounding, (U.S. EPA, 2021e; OECD, 2004a);

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	Recycling: industry data reported in the Emission Scenario Document on Additives in Rubber Industry and in the Generic Scenario on Use of Additives in Plastic Compounding (U.S. EPA, 2021e; OECD, 2004a). EPA conservatively assumed all workers of these OESs are exposed to vapor and to dust during a single shift. Therefore, EPA assessed the central tendency and high-end 8-hour TWA inhalation exposure concentrations of each of the 7 OESs by aggregating the surrogate DIBP vapor inhalation exposure concentrations and the DIBP dust inhalation exposure concentration that EPA calculated in accordance with the PNOR Model; this aggregation is described in Appendix B of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 7 OESs are in the range of 219 to 234 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a worker or are equal to the number of operating days that EPA assessed in the case of an OES. In some cases, EPA assessed the central tendency and high-end exposure frequency to be equal. <i>Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates</i> The strengths of the exposure estimates are the following: (a) the overall quality ratings of the cited references are high, (b) the surrogate dust inhalation exposure concentrations are derived from a large number of monitoring data that are related to the industries that the OESs are associated with, (c) the adjustment of the dust inhalation exposure concentrations based on estimates of the concentration of DIBP in products, (d) the surrogate vapor exposure concentrations are calculated from DIBP fugitive vapor release rates that are conservative relative to the DIBP fugitive vapor release rates expected for these OESs. The limitations of the exposure estimates are exposure concentrations that are surrogate data and uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is whether the assessed exposures represent the true distribution of potential exposures. The assessed vapor exposure concentrations are likely overestimates as discussed above. <i>Weight of Scientific Evidence Conclusion</i> EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths are the systematic review overall quality ratings of the data sources that are related to the assessed exposures, and the methods for estimation of the inhalation exposure concentrations, which are surrogate data. The limitations are the surrogate inhalation exposure data and uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is whether the assessed exposures represent the true distribution of potential exposures. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Application of adhesives and sealants	<i>Summary of the Assessment Method</i> In the cases of spray application of adhesives and spray application of paints and coatings, EPA estimated DIBP inhalation exposure concentrations in accordance with the Automotive Refinishing Spray Coating Mist Inhalation Model of the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a). Specifically, EPA calculated concentrations of DIBP in mist that workers are potentially exposed to via inhalation from the following factors: (1) the worker monitoring data reported in this ESD, (2) concentrations of DIBP in products as reported in SDSs and product data sheets of 28 adhesive and sealant

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Application of paints and coatings	products that contain DIBP in the case of the Application of adhesives and sealants OES and 3 paints and coatings products that contain DIBP in the case of the Application of the paints and coatings OES and, (3) the concentration of nonvolatile material in auto refinishing spray paint or coating products as reported in this ESD. The worker monitoring data that are reported in this ESD are concentrations of mist that workers are potentially exposed to during spray painting at auto refinishing shops and therefore these are surrogate monitoring data. In the case of non-spray application of adhesives and sealants and paints and coatings, EPA expects worker inhalation exposure to result from fugitive emissions of DIBP vapor. Accordingly, EPA assessed DIBP inhalation exposure concentrations by equating these concentrations to the exposure concentrations that EPA assessed in the case of the manufacturing OES. The exposure concentrations that EPA assessed in the case of the manufacturing OES are upper-bound exposures for these OES because the Agency determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case of worker inhalation exposure to DIBP vapor as discussed in Appendix D.14 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). EPA assessed the same exposure duration and frequency for the spray and non-spray scenarios in the case of both OESs. The Agency assumed the duration of worker exposure is 8 hours per day in the case of both OESs. With regard to exposure frequency and the OES of Application of adhesives and sealants, EPA assessed the central tendency and high-end values of exposure frequency to be equal to 232 days/year and 250 days/year, respectively. This central tendency value is based on the central tendency value of the number of release days and this high-end value is the maximum number of days per year that the Agency expects a worker to work. In the case of the OES of Application of paints and coatings, EPA assessed both the central tendency and high-end values of exposure frequency to be equal to 250 days/year, which the maximum number of days per year that the Agency expects a worker to work. <i>Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates of Spray Application</i> The strengths of the exposure estimates in the case of the spray application of products, both adhesives and sealants, and paints and coatings, are as follows: (a) the mathematical model of the calculations of inhalation exposure concentrations (<i>i.e.</i>, the Automotive Refinishing Spray Coating Mist Inhalation Model) is a model that is related to the assessed scenarios, (b) the overall quality rating of the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a) is medium, and (c) exposure concentrations were estimated from concentrations of DIBP in pertinent products as reported in the SDSs or product data sheets of these products; there is an exception to this strength because of one of the paints and coatings products as discussed below under limitations. A limitation of the spray application exposure estimates in general is that the mathematical model of the calculations of inhalation exposure concentrations (<i>i.e.</i>, the Automotive Refinishing Spray Coating Mist Inhalation Model) incorporates worker mist inhalation exposure monitoring data that are unrelated to DIBP. These are worker monitoring data that pertain to worker exposure to mist during auto refinishing; whether these data represent the concentrations of mist that workers would potentially be exposed to during spray application of adhesives products and paints and coatings products that contain DIBP is uncertain. Another limitation related to the mathematical model is that EPA is uncertain whether the concentrations of nonvolatile material that the Agency incorporated into the assessment represent the concentrations of nonvolatile material in the adhesive products and the paints and coatings products that contain DIBP that would be spray applied. A discussion of other limitations follows.

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	With regard to the spray application scenario of adhesives and sealants, a limitation of the exposure estimates is uncertainty about whether adhesive products containing DIBP are spray applied. EPA did not infer spray coating as the application method of any of the 28 adhesive or sealant products that are listed in Appendix E of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). However, spray application of adhesives in vehicle manufacturing is possible (OECD, 2015a) and DIBP is used in vehicle manufacturing (U.S. EPA, 2020c). Therefore, EPA conservatively assumed that workers may spray apply adhesives that contain DIBP. EPA did not assess spray application of sealant products. With regard to the spray application of paints and coatings, and in contrast to the case of adhesives and sealants, EPA did infer spray coating as the application method of some of the paints or coatings products that are listed in Appendix E of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). However, a limitation of the exposure assessment approach is that EPA classified a certain product that contains DIBP at a concentration of 30–60% by weight as a paint or coating product but EPA is uncertain of this classification because this product may actually be an adhesive product. Excepting this product, the maximum concentration of DIBP in paint or coating products is 5% by weight according to Appendix E of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). As a result of the aforementioned strengths and limitations, EPA is uncertain whether the assessed exposure concentrations represent the true distribution of potential exposures in the case of the OES of application of adhesives and sealants and the OES of Application of paints and coatings. With regard to exposure duration, EPA assessed the duration of exposure to mist that results from spray application of adhesive and paint and coating products that contain DIBP to be equal to a full 8-hour work shift, but this duration is likely lower because workers likely do other activities. These other activities may result in DIBP vapor exposures, which EPA determined are lower than the exposures to mist that contains DIBP, and therefore EPA’s assessment of exposure duration is conservative. The duration of spray application of adhesive products may be variable depending on the job site. EPA assessed 232 to 250 days of exposure per year based on workers applying adhesives on every working day, however, application sites may use DIBP-containing adhesives at much lower frequencies. The uncertainties discussed above decrease the weight of evidence. <i>Strengths, Limitations, and Uncertainties with the Exposure Estimates of Non-Spray Application</i> The strength of the exposure estimates is EPA’s high confidence in the surrogate inhalation exposure concentrations. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration. <i>Weight of Scientific Evidence Conclusions in the Case of Spray Application of Products</i> EPA’s confidence in the assessed high-end exposures in the case of spray application of paints and coatings is slight and EPA’s confidence in all of the other assessed exposures is moderate based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths of the exposure estimates in general are the mathematical model that is related to the assessed scenarios and, with one exception, the input variables of this model (<i>i.e.</i>, the concentrations of DIBP in products), which are DIBP-

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	specific. This exception is the maximum concentration of DIBP in paints and coatings which is uncertain. The limitations of the exposure estimates in general are the model parameters (<i>i.e.</i>, the mist inhalation exposure concentrations and the concentration of nonvolatile material in the products), which do not pertain to the assessed scenario, and the conservative value of the exposure duration, which is equal to a full 8-hour shift. There is uncertainty in the assessed exposures in general, but this uncertainty is greater in the case of the high-end exposures of the spray application of paints and coatings because of the uncertainty in the maximum concentration of DIBP in paints and coatings. EPA has slight to moderate confidence in the assessed central tendency inhalation exposures for ONUs and slight confidence in the assessed high-end inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures. <i>Weight of Scientific Evidence Conclusions in the Case of Non-Spray Application of Products</i> The strength of the exposure estimates is EPA's high confidence in the surrogate inhalation exposure concentrations. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration.
Use of laboratory chemicals – solids Fabrication and final use of products or articles	<i>Summary of the Assessment Method</i> Each of these 2 OESs includes fugitive emissions of dust that contains DIBP as discussed in the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate</i> (U.S. EPA, 2025t). Accordingly, EPA assessed inhalation exposure concentrations in accordance with the PNOR Model. Specifically, EPA calculated inhalation exposure concentration as the product of the following 2 factors: (1) central tendency and high-end worker monitoring data that are inhalation exposure concentrations in the case of worker exposure to respirable dust at sites associated with certain NAICS codes and (2) the concentration of DIBP in products. These worker monitoring data on respirable dust are a part of the PNOR Model, are derived from OSHA CEHD data (OSHA, 2020), and were rated high for data quality via systematic review. The worker monitoring data of the PNOR Model that are respirable dust inhalation exposure concentrations are classified by NAICS codes. In the case of each of the 2 OESs, EPA selected the monitoring data that are associated with the NAICS code that EPA deemed to be the most appropriate. These NAICS codes are as follows: NAICS code 54 (Professional, Scientific, and Technical Services) in the case of use of laboratory chemicals – solids and NAICS code 337 (Furniture and Related Product Manufacturing) in the case of fabrication and final use of products or articles. EPA assessed the mass concentration of DIBP in solid material containing DIBP in the case of each of the 2 OESs to be equal to the following concentration data which were generally rated high for data quality via systematic review: • Use of laboratory chemicals – solids: data reported in SDSs; • Fabrication and final use of products or articles: industry data provided by the Emission Scenario Document on Additives in Rubber Industry and Generic Scenario on Use of Additives in Plastic Compounding, (U.S. EPA, 2021e; OECD, 2004a). EPA assessed exposure duration to be 8 hours per day in the case of each of the 2 OESs because the worker monitoring inhalation exposure concentrations are 8-hour TWA concentrations. The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 2 OESs are in the range of 219 to 250 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	worker or are equal to the number of operating days that EPA assessed in the case of an OES. In the case of the OES of fabrication and final use of products or articles, EPA assessed the central tendency and high-end exposure frequency to be equal. <i>Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates</i> The strengths of the exposure estimates are the following: (a) the overall quality ratings of the cited references are high, and (b) the dust inhalation exposure concentrations are derived from a large number of monitoring data that are related to the industries that the OESs are associated with, and (c) the adjustment of the dust inhalation exposure concentrations based on estimates of the concentration of DIBP in products. The limitations of the exposure estimates are as follows: (a) the assessment of exposure concentrations that are equal to or are based on surrogate exposure concentrations and (b) uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is the uncertainty of whether the assessed exposures represent the true distribution of potential exposures. <i>Weight of Scientific Evidence Conclusion</i> EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Dermal exposure	<i>Summary of the Assessment Method</i> Dermal exposure to DIBP was assessed by EPA from dermal absorption flux, surface area, exposure duration and exposure frequency. Because there were no data available to represent the rate of absorption of DIBP through human skin, EPA selected surrogate data from an <i>in vitro</i> dermal absorption study that measured the rate of absorption of a similar compound (<i>i.e.</i>, DBP) through human skin (Scott et al., 1987). DBP and DIBP are isomers with similar physical-chemicals properties and similar rates of dermal absorption in live rats (Elsisi et al., 1989). Further, dermal absorption modeling of DIBP (Section 2.4.3.2 of the <i>Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025t)) supports the selection of surrogate dermal absorption data. It is important to note that the value of absorptive flux (<i>i.e.</i>, 7.0×10^{-5} mg/cm²/hr) was measured by Scott <i>et al.</i> (1987) using neat liquid DBP, and therefore, the flux value is most applicable to the absorption of liquid materials. It is expected that contact with solid materials will result in a lower rate of dermal absorption than contact with liquid materials due to reduced mobility of molecules that exist within a solid matrix. Regarding surface area of dermal exposure to workers handling DIBP, EPA assumed the high-end exposure surface area was equivalent to mean values for two-hand surface area (<i>i.e.</i>, 1,070 cm² for male workers and 890 cm² for female workers) and the central tendency surface area was equivalent to only a single hand (or 1 side of 2 hands) (<i>i.e.</i>, 535 cm² for male workers and 445 cm² for female workers). Regarding surface area of dermal exposure to ONUs experiencing incidental contact to dust or mist deposited on surfaces, EPA assumed the high-end exposure surface area was equivalent to the mean value for 2 palms of adult males (<i>i.e.</i>, 535 cm²) and the central tendency surface area was equivalent to the mean value for one palm of an adult male (<i>i.e.</i>, 268 cm²) (U.S. EPA, 2011a).

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	Regarding duration of dermal absorption of DIBP, it was assumed that a worker may contact DIBP multiple times throughout a workday and that the material will remain on the skin until washed. Therefore, the duration of absorption was assumed as 8 hours (U.S. EPA, 1991) for estimating both central tendency and high-end exposures for all workers. It is important to note that EPA did not assume that the worker handles the chemical for 8 hours, but that a non-volatile substance contacted multiple times per workday may exist on the skin surface for 8 hours. Regarding exposure frequency, an averaging time for intermediate dermal exposures was assumed as 22 days out of 30 days for both high-end and central tendency estimates. For chronic non-cancer dermal exposure estimates, averaging time was assumed as 250 days out of 365 days over the number of working years and central tendency average time ranged from 208 to 250 days out of 365 days over the number of working years. These estimates are based on the number of operating days and workers may not be exposed daily based on task and scenario. <i>Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates</i> The absorptive flux of 7.0×10^{-5} mg/cm²/hr measured by Scott (1987) is most representative of dermal absorption of DIBP from liquid compounds, and this value serves as an upper bound for the dermal absorption of DIBP from solid materials. More specifically, it is expected that absorption of DIBP from solid materials will not exceed the rate of absorption of DIBP from liquid materials. The study of Scott (1987) may have used non-viable human skin samples; however, the skin integrity of the samples were demonstrated using tritiated water. OECD Document 28 <i>Guidance Document for the Conduct of Skin Absorption Studies</i> (OECD, 2004b) indicates that non-viable skin may be used if skin integrity is demonstrated. Since the data source that reported the rate of absorption of DBP (Scott et al., 1987) received a medium rating through the systematic review process, and there are multiple streams of evidence supporting the surrogate use of DBP absorption data for estimation of DIBP absorption (<i>i.e.</i>, physical-chemical property similarities, <i>in vivo</i> rat absorption similarities, and DIBP dermal modeling), the identified absorption rate for estimation of DIBP dermal absorption is considered a strength of the assessment. Regarding the surface area of dermal exposure for workers handling DIBP, as well as the surface area of exposure for ONUs experiencing incidental contact with contaminated surfaces, there is high confidence in the surface area measurements presented in the exposure factors handbook but moderate confidence in the application of the surface area measurements to the occupational dermal exposure assessment. Although surface area related to hands and palms seem representative for handling of chemicals and contact with contaminated surfaces, exposure surface area may vary depending on task and scenario. Regarding duration of dermal absorption of DIBP, there is moderate confidence that an absorption duration of 8 hours is representative of potential occupational dermal exposures to DIBP. The duration may be more or less than 8 hours depending on worker tasks and scenario. Regarding exposure frequency, it is possible that a worker may be exposed each working day, but there is uncertainty in worker exposure frequency due to variations in worker responsibilities. EPA has moderate confidence that the number of operating days for a given OES are representative of potential worker exposure frequencies to DIBP. However, ONUs are not likely to experience dermal

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	contact daily, though incidental contact with a contaminated surface may occur on an acute basis. Therefore, there is greater uncertainty that the number of operating days is representative of potential ONU exposure frequencies to DIBP. <i>Weight of Scientific Evidence Conclusion</i> The main strength of the assessment approach is the incorporation of the empirical <i>in vitro</i> human skin absorption data of Scott (1987) into the assessment. However, the selected absorptive flux is most representative of dermal absorption of DIBP from liquid materials, and there is uncertainty extending neat liquid absorptive flux measurements to the absorption of DIBP from solid materials. Also, there is uncertainty regarding the extent and frequency of dermal exposures to ONUs. Therefore, EPA has moderate confidence in dermal exposure estimates for workers handling liquid DIBP, and there is slight to moderate confidence in dermal exposure estimates for workers handling solids containing DIBP and for ONU dermal exposure estimates.

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4.1.2 Consumer Exposures

The following subsections briefly describe EPA's approach to assessing consumer exposures and provide exposure assessment results for each COU. The *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)) provides additional details on the development of approaches and the exposure assessment results. The consumer exposure assessment evaluated exposures from individual COUs while the indoor dust assessment uses a subset of consumer articles with large surface area and presence in indoor environments to garner COU-specific contributions to the total exposures from dust.

4.1.2.1 Summary of Consumer and Indoor Dust Exposure Scenarios and Modeling Approach and Methodology

The main steps in performing a consumer exposure assessment are summarized below:

- Identification and mapping of product and article examples following the consumer COU table (Table 1-1), product, and article identification.
- Compilation of products and articles manufacturing use instructions to determine patterns of use.
- Selection of exposure routes and exposed populations according to product/article use descriptions.
- Identification of data gaps and further search to fill gaps with studies, chemical surrogates or product and article proxies, or professional judgement.
- Selection of appropriate modeling tools based on available information and chemical properties.
- Gathering of input parameters per exposure scenario.
- Parameterization of selected modeling tools.

Consumer products or articles containing DIBP were matched with the identified consumer COUs. Table 4-6 summarizes the consumer exposure scenarios by COU for each product example(s), the exposure routes, which scenarios are also used in the indoor dust assessment, and whether the analysis was conducted qualitatively or quantitatively, see Sections 2.2.1 and 2.2.2 in ([U.S. EPA, 2025d](#)) for detailed descriptions, explanations, and rationale. The indoor dust assessment uses consumer products and articles information for selected items with the goal of recreating the indoor environment. The subset of consumer products and articles that are used in the indoor dust assessment are selected for their potential to have large surface area for dust collection, roughly larger than 1 m².

When a quantitative analysis of reasonably available information was conducted, exposure from the consumer COUs was estimated by modeling. Exposure via inhalation and ingestion routes were modeled using EPA's Consumer Exposure Model (CEM), Version 3.2 ([U.S. EPA, 2023b](#)). Dermal exposures for both liquid products and solid articles were calculated outside of CEM, see *Draft Consumer Exposure Analysis for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025f](#)) for calculations and inputs. CEM dermal modeling was not used in this assessment because CEM uses a dermal model approach that assumes infinite DIBP migration from product to skin without considering saturation, which results in overestimations of dose and subsequent risk, see Section 2.3 in U.S. EPA ([2025d](#)) for a detailed explanation. Dermal exposures were estimated using a computational framework implemented within a spreadsheet environment using a flux-limited dermal absorption approach for liquid and solid products. For each exposure route assessed and for various modeling input parameters (*e.g.*, weight fractions, duration use), EPA used the 10th percentile, average, and 95th percentile value of an input parameter (*e.g.*, weight fraction, surface area) where possible to characterize low, medium, and high exposure scenarios for a given COU. If only a range was reported, EPA used the minimum and maximum of the range as the low and high values, respectively. The average of the reported low and high values from the reported range was used for the medium exposure scenario. See *Draft Consumer and Indoor Dust*

Exposure Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025d](#)) for details about the consumer modeling approaches, sources of data, model parameterization, and assumptions. High, medium, and low intensity use exposure scenarios serve as a two-pronged approach. First, it provides a sensitivity analysis with insight on the impact of the main modeling input parameters (*e.g.*, skin contact area, duration of contact, and frequency of contact) in the doses and risk estimates. And second, the high intensity use exposure scenarios are used first to screen for potential risks at the upper bound of possible exposures, and to refine if needed.

Exposure via the inhalation route occurs from inhalation of DIBP gas-phase emissions or when DIBP partitions to suspended particulate from direct use or application of products. However, DIBP's low volatility is expected to result in negligible gas-phase inhalation exposures. Sorption to suspended and settled dust is likely to occur based on monitoring data (see indoor dust monitoring data in Section 4.1.2.1) and its affinity for organic matter that is typically present in household dust. Thus, inhalation and ingestion of suspended and settled dust is considered in this assessment. Exposure via the dermal route can occur from direct contact with products and articles. Exposure via ingestion depends on the product or article use patterns. Exposure can occur via direct mouthing (*i.e.*, directly putting product in mouth) in which the person can ingest settled dust with DIBP, or directly ingesting DIBP from migration to saliva. Additionally, ingestion of suspended dust can occur when DIBP migrates from article to dust or partitions from gas-phase to suspended dust.

EPA made some adjustments to match CEM's lifestages to those listed in CDC guidelines ([CDC, 2021](#)) and EPA's *A Framework for Assessing Health Risks of Exposures to Children* ([U.S. EPA, 2006](#)). CEM lifestages are re-labeled from this point forward as follows:

- Adult (21+ years) → Adults
- Youth 2 (16–20 years) → Teenagers
- Youth 1 (11–15 years) → Young teens
- Child 2 (6–10 years) → Middle childhood
- Child 1 (3–5 years) → Preschoolers
- Infant 2 (1–2 years) → Toddlers
- Infant 1 (<1 year) → Infants

EPA assessed acute, intermediate, and chronic exposures to DIBP from consumer COUs. For the acute dose rate calculations, an averaging time of 1 day is used representing the maximum time-integrated dose over a 24-hour period during the exposure event. The chronic dose rate is calculated iteratively at a 30-second interval during the first 24 hours and every hour after that for 60 days and averaged over 1 year. Intermediate dose is the exposure to continuous or intermittent (depending on product) use during a 30-day period, roughly one month. See Sections 2.2.1 and 2.2.2 and Appendix A in ([U.S. EPA, 2025c](#)) for details about acute, chronic, and intermediate dose calculations. Professional judgment and product use descriptions were used to estimate events per day and per month/year for the calculation of the intermediate/chronic dose.

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Table 4-6. Summary of Consumer COUs, Exposure Scenarios, and Exposure Routes

Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route ^a	Evaluated Routes				
				Inhalation ^b	Dermal	Ingestion		
						Suspended Dust	Settled Dust	Mouthings
Adhesives and sealants	Adhesives and sealants	Wood flooring adhesive	Use of product in DIY large-scale home repair activities. Direct contact during use; inhalation of emissions during use	QT	QT	QL	QL	QL
Adhesives and sealants	Adhesives and sealants	Concrete and masonry adhesive adhesives for small repairs	Use of product in DIY small-scale home repair activities. Direct contact during use	QL	QT	QL	QL	QL
Adhesives and sealants	Adhesives and sealants	Small projects with seaming adhesive and a fire caulk	Use of product in DIY home repair activities. Direct contact during use; inhalation of emissions during use	QT	QT	QL	QL	QL
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Indoor furniture	Direct contact during use; inhalation of emissions/ingestion of airborne particulate; ingestion by mouthings	QT ^c	QT	QT ^c	QT ^c	QT
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Children's clothing	Direct contact during use	QL	QT	QL	QL	QL
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Clothing synthetic leather for teenagers and adults	Direct contact during use	QL	QT	QL	QL	QL
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Articles with semi-routine contact. Variety PVC articles: bags, belts, headband accessories, and steering wheel cover	Direct contact during use	QL	QT	QL	QL	QL
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Footwear components	Direct contact during use	QL	QT	QL	QL	QL

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Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route ^a	Evaluated Routes				
				Inhalation ^b	Dermal	Ingestion		
						Suspended Dust	Settled Dust	Mouth
Floor coverings	Floor coverings	Vinyl flooring	Direct contact, inhalation of emissions / ingestion of dust adsorbed chemical	QT ^c	QT	QT ^c	QT ^c	QL
Floor coverings	Floor coverings	Carpet tiles	Direct contact, inhalation of emissions / ingestion of dust adsorbed chemical	QT ^c	QT	QT ^c	QT ^c	QL
Paints and coatings	Paints and coatings	Articles with semi-routine contact; paint	Direct contact during use	QL	QT	QL	QL	QL
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Air beds	Direct contact during use, inhalation of emissions / ingestion of dust adsorbed chemical while in place	QT ^c	QT	QT ^c	QT ^c	QL
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Car mats	Direct contact during use. See routine contact scenario inhalation of emissions / ingestion of dust adsorbed chemical	QT ^c	QT	QT ^c	QT ^c	QL
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Wallpaper	Direct contact during installation (teenagers and adults) and while in place; inhalation of emissions / ingestion of dust adsorbed chemical	QT ^c	QT	QT ^c	QT ^c	QL
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Shower curtain	Direct contact during use. See routine contact scenario inhalation of emissions / ingestion of dust adsorbed chemical while hanging in place	QT ^c	QT	QT ^c	QT ^c	QL
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Articles with semi-routine contact. Tires and variety PVC articles: bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard	Direct contact during use	QL	QT	QL	QL	QL

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Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route ^a	Evaluated Routes				
				Inhalation ^b	Dermal	Ingestion		
						Suspended Dust	Settled Dust	Mouthing
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Children's toys (legacy). produced after CFR regulatory limitations, 0.1%.	Collection of toys. Direct contact during use; inhalation of emissions / ingestion of airborne particulate; ingestion by mouthing	QT ^c	QT	QT ^c	QT ^c	QT
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	children's toys (new). produced after CFR regulatory limitations, 0.1%.	Collection of toys. Direct contact during use; inhalation of emissions / ingestion of airborne PM; ingestion by mouthing	QT ^c	QT	QT ^c	QT ^c	QT
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Tire crumb, artificial turf	Direct contact during use (particle ingestion via hand-to-mouth)	QT	QT	QT ^d		
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Articles with semi-routine contact. Variety PVC articles: diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	Direct contact during use	QL	QT	QL	QL	QL
Disposal	Disposal	Down the drain products and articles	Down the drain and releases to environmental media	QL	QL	QL	QL	QL
Disposal	Disposal	Residential end-of-life disposal, product demolition for disposal	Product and article end-of-life disposal and product demolition for disposal	QL	QL	QL	QL	QL

CFR = Code of Federal Regulations [16 CFR 1307.3(b)]. DIY– do-it-yourself; QL = qualitative analysis; **QT** = quantitative analysis
 In accordance with section 108(b)(3) of the Consumer Product Safety Improvement Act of 2008 (CPSIA), 16 CFR 1307.3(b) prohibits any children's toy or childcare article that contains concentrations >0.1% of DIBP as of July 2018. Section 108(b)(3) of the CPSIA 2008 requires the CPSC to promulgate a final rule regarding certain phthalates in children's toys and childcare articles. This rule must be issued within 180 days of receiving a final report from the Chronic Hazard Advisory Panel (CHAP), which was published in July 2014.
^a See Sections 2.2.1 and 2.2.2 in ([U.S. EPA, 2025e](#)) for details about exposure scenarios per COU and product example and exposure routes assessed quantitatively and qualitatively.
^b Inhalation scenarios considered suspended dust and gas-phase emissions.
^c These indoor dust articles scenarios consider the surface area from multiple articles such as toys, while furniture and flooring already have large surface areas. For these articles dust can deposit and contribute to significantly larger concentration of dust than single small articles
^d The tire crumb and artificial turf ingestion route assessment considers all 3 types of ingestions, settled dust, suspended dust, and mouthing altogether, but results cannot be provided separately as it was done for all other articles and products.

Inhalation and Ingestion Exposure Routes Modeling Approaches

Key parameters for articles modeled in CEM Version 3.2 are summarized in detail in Section 2 in *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025e](#)). Calculations, sources, input parameters and results are also available in *Draft Consumer Exposure Analysis for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)). Generally, and when possible, model parameters were determined based on specific articles identified in this assessment and CEM defaults were only used where specific information was not available. A list of some of the most important input parameters in developing representative scenarios for the selected modeling tools and approaches for exposure from articles and products is included below. Of these, the chemical migration rate from articles to saliva and area mouthed are most important parameters for mouthing exposure scenarios. Duration, frequency and amount used have been determined to be key determinants of estimated exposure concentrations according to a sensitivity analysis conducted for CEM input parameters Consumer Exposure Model (CEM), Version 3.2 ([U.S. EPA, 2023b](#)).

- weight fraction (articles and products);
- density (articles and products);
- duration of use (products);
- frequency of use for chronic, acute, and intermediate (products);
- product mass used (products);
- article surface area (articles);
- chemical migration rate to saliva (articles);
- area mouthed (articles); and
- use environment volume (articles and products).

For each scenario, high-, medium-, and low-intensity use exposure scenarios were developed in which values for duration of use, frequency of use, and surface area were determined based on reasonably available information or professional judgment. Each input parameter listed above was parameterized according to the article-specific data found via systematic review. If article-specific data were not available, CEM default parameters were used, or if CEM default parameters were not applicable, an assumption based on article use descriptions by manufacturers was used, always leaning on the health protective values. For example, for all scenarios, the near-field modeling option was selected to account for a small personal breathing zone around the user during product use in which concentrations are higher, rather than employing a single well-mixed room. This represents a conservative modeling assumption in the absence of article-specific emission data. A near-field volume of 1 m³ was selected. See Section 2.1 for weight fraction selection and Section 2.2.3 for parameterization details in the *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)).

Dermal Exposure Routes Modeling Approaches

Dermal modeling was performed outside of CEM. The use of the CEM model for dermal absorption, which relies on total concentration rather than aqueous saturation concentration, would greatly overestimate exposure to DIBP in liquid and solid products and articles. See U.S. EPA ([2025d](#)) for more details. See *Draft Consumer Exposure Analysis for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025f](#)) for calculations and inputs. EPA used a dermal exposure modeling approach with a range of input parameters for contact surface area and duration and frequency of contact ranging from conservative to being representative of expected uses. The flux-limited screening dermal absorption approaches for liquid and solid products and articles assumes a constant rate of absorption of DIBP in contact with the skin. Dermal flux value (liquid and solid products) were calculated and applied in the corresponding scenario. The flux-limited screening approach provides an upper-bound of dermal absorption of DIBP and likely results in some overestimations for solid articles and is more representative for liquid products. See Section 4.1.2.4 for discussion on limitations, strengths, and confidence of this approach.

For each product or article, high-, medium-, and low-intensity use exposure scenarios were developed. Values for duration of dermal contact and area of exposed skin were determined based on the reasonably expected use for each item. Key parameters for the dermal model are shown in Section 2.3 in U.S. EPA (2025d).

4.1.2.2 Modeling Dose Results by COU for Consumer

This section summarizes the dose estimates from inhalation, ingestion, and dermal exposure to DIBP in consumer products and articles. Detailed tables of the dose results for acute, intermediate, and chronic exposures are available in the *Draft Consumer Risk Calculator for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025g). Modeling dose results for acute, intermediate, and chronic exposures and data patterns are described in Section 3 in the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025d).

For teens and young adults (11–20 years), and adults (21+ years), dermal contact was a strong driver of exposure to DIBP from consumer products and articles, with the dose received being generally higher than or similar to the dose received from exposure via inhalation or ingestion. The largest dose estimated is for acute and chronic dermal exposure to synthetic leather furniture for all lifestages. Among the younger lifestages (infant to 11 years), the pattern was less clear as these ages were not designated as product users and therefore not modeled for dermal contact with any of the liquid products assessed. Key differences in exposures among lifestages include designation as a product user or bystander, behavioral differences such as hand-to-mouth contact times and time spent on the floor, and dermal contact expected from touching specific articles that may not be appropriate for some lifestages.

4.1.2.3 Indoor Dust Assessment

PVC products and articles that contain DIBP are ubiquitous in modern indoor environments, and DIBP can partition, migrate, or evaporate (to a lesser extent based on physical and chemical properties) into indoor air and concentrate in household dust. See Sections 4.1 and 4.2 of the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025d) for a summary of indoor dust monitoring data that EPA used to establish the presence of DIBP in indoor dust in the residential environment. Exposure to DIBP through dust ingestion, dust inhalation, and dermal absorption is a particular concern for young children between the ages of 6 months and 2 years, as they crawl on the ground and pull up on ledges, which increases hand-to-dust contact, and place their hands and objects in their mouths. Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area (exceeding $\sim 1 \text{ m}^2$) for either a single article or collection of like articles as appropriate. In a screening assessment, EPA considered the aggregation of chronic dust ingestion doses, see Section 4.3 in the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025d). The highest dose was for preschoolers aged 3 to 5 years.

Articles in the indoor assessment included the following:

- furniture components (textiles);
- carpet tiles;
- vinyl flooring;
- air beds;
- car mats;
- shower curtains;
- in-place wallpaper;
- children's toys, both legacy and new; and

- tire crumb.

4.1.2.4 Weight of Scientific Evidence Conclusions for Consumer Exposure

Key sources of uncertainty for evaluating exposure to DIBP in consumer goods and strategies to address those uncertainties are described in detail in Section 5.1 of the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)). Generally, designation of robust confidence suggests that the supporting scientific evidence weighted against the uncertainties is adequate to characterize exposure assessments. The supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the exposure estimate. The designation of moderate confidence suggests that the supporting evidence weighed against the uncertainties is reasonably adequate to characterize exposure assessments. The designation of slight confidence is assigned when the weight of scientific evidence may (1) not be adequate to characterize the scenario, and (2) in the absence of complete information and there are additional uncertainties that may need to be considered. The designation of slight to moderate confidence suggests that some aspects of the analysis are reasonably adequate but other aspects are not adequate or well understood to characterize the exposure. The overall confidence to use the results for risk characterization ranges from moderate to robust, depending on COU scenario. The basis for the moderate to robust confidence in the overall exposure estimates reflects a balance between using parameters that will represent various populations' use patterns and emphasizing conservative assumptions that are not excessive or unreasonable.

The exposure assessment of chemicals from consumer products and articles has inherent challenges due to many sources of uncertainty in the analysis, including variations in product formulation, patterns of consumer use, frequency, duration, and application methods. Variability in environmental conditions might also alter physical and/or chemical behavior of the product or article. Table 4-7 summarizes the overall confidence per COU and a discussion of rationale used to assign the overall confidence. The subsections ahead of the table describe sources of uncertainty for several parameters used in consumer exposure modeling that apply across COUs and provide an in depth understanding of sources of uncertainty and limitations and strengths within the analysis. The confidence to use the results for risk characterization ranges from moderate to robust.

Product Formulation and Composition

Variability in the formulation of consumer products, including changes in ingredients, concentrations, and chemical forms, can introduce uncertainty in exposure assessments. However, EPA reduced uncertainty by using reported concentrations from product-specific SDSs. EPA obtained DIBP weight fractions in various products and articles from material SDSs, databases, and existing literature. A large amount of data was available for DIBP in consumer goods published across several studies conducted by the Danish EPA ([Danish EPA, 2020](#)). EPA used the Danish EPA information under the assumption that the weight fractions reported by the Danish EPA are representative of DIBP content that could be present in items sold in the United States. Where possible, the Agency obtained multiple values for weight fractions for similar products or articles. The lowest value was used in the low exposure scenario, the highest value in the high exposure scenario, and the average of all values in the medium exposure scenario. EPA decreased uncertainty in exposure and subsequent risk estimates in the high-, medium-, and low-intensity use scenarios by capturing the weight fraction variability and obtaining a better characterization of the products and articles varying composition within one COU. Overall weight fraction confidence is *moderate* for products/articles with multiple sources but insufficient description on how the concentrations were obtained, *robust* for products/articles with more than one source, and *slight* for articles with only one source with unconfirmed content or little understanding on how the information was produced.

Product Use Patterns

Consumer use patterns such as frequency of use, duration of use, methods of application, and skin contact area are expected to differ. Where possible, high, medium, and low default values from CEM Version 3.2's prepopulated scenarios were selected for mass of product used, duration of use, and frequency of use. In instances where no prepopulated scenario was appropriate for a specific product, low, medium, and high values for each of these parameters were estimated based on the manufacturers' product descriptions. EPA decreased uncertainty by selecting use pattern inputs that represent product and article use descriptions and furthermore capture the range of possible use patterns in the high- to low-intensity use scenarios. Exposure and risk estimates are considered representative of product use patterns and well characterized. The overall confidence is rated *robust* for most product use patterns.

Article Use Patterns

For articles inhalation and ingestion exposures the high, medium, and low intensity use scenarios default values from CEM Version 3.2's prepopulated scenarios were selected for indoor use environment/room volume, interzone ventilation, and surface layer thickness. For articles dermal exposures use patterns such as duration and frequency of use and skin contact area are expected to have a range of low to high use intensities. For articles, which do not use duration of use as an input in CEM, professional judgment was used to select the duration of use/article contact duration for the low, medium, and high exposure scenario levels for most articles except for carpet tiles and vinyl flooring. Carpet tiles and vinyl flooring contact duration values were taken from EPA's Standard Operating Procedures for Residential Pesticide Exposure Assessment for the high exposure level (2 hours; time spent on floor surfaces) ([U.S. EPA, 2012b](#)), ConsExpo ([U.S. EPA, 2012b](#)) for the medium exposure level (1 hour; time a child spends crawling on treated floor), and professional judgment for the low exposure level (0.5 hour). There are more uncertainties in the assumptions and professional judgment for contact duration inputs for articles, and hence EPA has *moderate* confidence in those inputs.

Article Surface Area

The surface area of an article directly affects the potential for DIBP emissions to the environment. For each article modeled for inhalation exposure, low, medium, and high estimates for surface area were calculated (Section 2 in ([U.S. EPA, 2025d](#))). This approach relied on manufacturer-provided dimensions where possible, or values from EPA's *Exposure Factors Handbook* for floor and wall coverings. For small items that might be expected to be present in a home in significant quantities, such as children's toys, aggregate values were calculated for the cumulative surface area for each type of article in the indoor environment. Overall confidence in surface area is *robust* for articles like furniture, wall coverings, flooring, toys, and shower curtains because there is a good understanding of the presence and dimensions in indoor environments.

Human Behavior

CEM Version 3.2 has three different activity patterns: stay-at-home, part-time out-of-the home (daycare, school, or work), and full-time out-of-the-home. The activity patterns were developed based on the Consolidated Human Activity Database (CHAD). For all products and articles modeled, the stay-at-home activity pattern was chosen as it is the most protective assumption.

Mouthing durations are a source of uncertainty in human behavior. The data used in this assessment are based on a study in which parents observed children (n = 236) ages 1 month to 5 years of age for 15 minutes per sessions and 20 sessions in total ([Smith and Norris, 2003](#)). There was considerable variability in the data due to behavioral differences among children of the same lifestage. For instance, while children aged 6 to 9 months had the highest average mouthing duration for toys at 39 minutes per day, the minimum duration was 0 minutes and the maximum was 227 minutes per day. The observers

noted that the items mouthed were made of plastic roughly 50 percent of the mouthing time, but this was not limited to soft plastic items likely to contain significant plasticizer content. In another study, 169 children aged 3 months to 3 years were monitored by trained observers for 12 sessions at 12 minutes each ([Greene, 2002](#)). They reported mean mouthing durations ranging from 0.8 to 1.3 minutes per day for soft plastic toys and 3.8 to 4.4 minutes per day for other soft plastic objects (except pacifiers). Thus, it is likely that the mouthing durations used in this assessment (*e.g.*, 39.2 min/day for high intensity use for toys or infants <1, see Table 2-6 in U.S. EPA ([2025d](#))) provide a health protective estimate for mouthing of soft plastic items likely to contain DIBP. EPA assigned a *moderate* confidence associated with mouthing estimates duration of activity because the magnitude of the overestimation is not well characterized. All other human behavior parameters are well defined and understood, or the ranges used capture use patterns representative of various lifestages, which results in a *robust* confidence in use patterns.

Inhalation and Ingestion Modeling Tool

Confidence in the model used considers whether the model has been peer reviewed, as well as whether it is being applied in a manner appropriate to its design and objective. The model used, CEM Version 3.2, has been peer reviewed ([ERG, 2016](#)), is publicly available, and has been applied in the manner intended by estimating exposures associated with uses of household products and/or articles. This also considers the default values data source(s) such as building and room volumes, interzonal ventilation rates, and air exchange rates. Overall confidence in the proper use of CEM for consumer exposure modeling is *robust*.

Dermal Modeling for DIBP Exposure for Liquids and Solids

Experimental dermal data was identified via the systematic review process to characterize consumer dermal exposures to liquids or mixtures and formulations containing DIBP, see Sections 2.3.1 and 2.3.2 in U.S. EPA ([2025d](#)). The determination of uncertainties supporting scientific evidence is reasonably adequate to characterize exposure estimates. The confidence in the dermal exposure to liquid and solid products model used in this assessment is *moderate*.

EPA identified only one set of experimental data related to the dermal absorption of neat DIBP ([Elsisi et al., 1989](#)). This dermal absorption study was conducted *in vivo* using male F344 rats. There have been additional studies conducted to determine the difference in dermal absorption between rat skin and human skin. Specifically, Scott ([1987](#)) examined the difference in dermal absorption between rat skin and human skin for four different phthalates (*i.e.*, DMP, DEP, DBP, and DIBP) using *in vitro* dermal absorption testing. Results from the *in vitro* dermal absorption experiments showed that rat skin was more permeable than human skin for all four phthalates examined. Because there is uncertainty regarding the magnitude of difference between dermal absorption through rat skin versus human skin for DIBP, based on DIBP physical and chemical properties (size, solubility), EPA is confident that the DBP *in vitro* human dermal absorption data from Scott et al. ([1987](#)) provides a representative upper bound of expected uses for dermal absorption of DIBP for solid articles and a representative dermal absorption for liquid products based on the findings of Scott ([1987](#)).

Differences in skin structure and metabolism between rats and humans may limit the direct applicability of rat data to human scenarios. The flux of other phthalates across rat skin has been shown to be about 2 to 10 times higher than the flux across human skin for the same chemical. Additionally, the permeation characteristics of neat chemicals may differ from those of saturated solutions of phthalates. Because DIBP is strongly hydrophobic, dermal flux of neat chemical is expected to be lower than that of saturated solutions, introducing a potential underestimation of dermal flux when extrapolating from neat DIBP to aqueous solutions.

Another source of uncertainty regarding the dermal absorption of DIBP from products or formulations stems from the varying concentrations and co-formulants that exist in products or formulations containing DIBP. For purposes of this risk evaluation, EPA assumes that the absorptive flux of neat DIBP measured from *in vitro* human experiments for the absorptive flux of aqueous DIBP serves as an upper bound of potential absorptive flux of chemical into and through the skin for dermal contact with all solid products. While for liquid products or formulations the *in vitro* experiments for the absorptive flux of neat DIBP is more representative of potential absorptive flux of chemical into and through the skin for dermal contact with all liquid products. However, dermal contact with products or formulations that have lower concentrations of DIBP may exhibit lower rates of flux since there is less material available for absorption. Conversely, co-formulants or materials within the products or formulations may lead to enhanced dermal absorption, even at lower concentrations. Therefore, it is uncertain whether the products or formulations containing DIBP would result in decreased or increased dermal absorption. Based on the available dermal absorption data for DIBP, EPA has made assumptions that result in exposure assessments that are the most representative of expected exposures while leaning on conservative approaches.

Experimental dermal data like migration or emission rates or dermal loading were not identified via the systematic review process to estimate dermal exposures to solid products or articles containing DIBP and a modeling approach was used to estimate exposures, see Section 2.3.2 in U.S. EPA (2025d). Based on the available *in vitro* dermal absorption data for DBP, which is used as a surrogate for DIBP due to chemical similarities, there is *moderate* confidence in the estimated rate of absorption from liquid materials containing DIBP. Therefore, there is *moderate* confidence that the estimated rate of absorption for DIBP serves as an upper bound for the absorption of a solid material.

Ingestion Via Mouthing

Very little data were available for migration rates of DIBP from solid articles to saliva, and no data were found with weight fractions of DIBP similar to those reported for the articles assessed here (< 2 percent DIBP by weight). The weight fraction range used in this assessment for the articles evaluated for mouthing—specifically the two children’s toys’ scenarios—are significantly below the range considered for the empirical chemical migration data for other phthalates. A theoretical framework based on physical and chemical properties of DIBP and the solid matrix material was used to estimate chemical migration rates, in the absence of adequate empirical data. This model was internally and externally validated against measured diffusion coefficients and shown to have good predictive capability for chemicals with molecular weights between 30 and 1,178 g/mol at temperatures between 4 and 180 °C (Aurisano et al., 2022), which are well within DIBP properties and temperatures during product use.

Major limitations of the chemical migration rate estimate calculation approach are that there is no understanding of the correlation between concentration of DIBP in consumer products and the calculated chemical migration rate, and there is no available data to compare the estimated chemical rate value. These limitations result in a significant level of uncertainty for the estimated chemical migration rate, as the value may also differ among similar items due to variations in chemical makeup and polymer structure. Thus, it is unclear whether the migration rate value is applicable to consumer goods with low weight fractions of DIBP. EPA has a *slight* confidence in the chemical migration rate value in the context of this assessment consumer product considerations and a *slight* confidence in the overall modeling approach even when considering the moderate confidence in the mouthing durations and other modeling inputs. Note that overall confidence in ingestion exposures considers the aggregation of ingestion of suspended dust, settled dust, and if applicable to the scenario, ingestion via mouthing. Confidence in dust ingestion was moderate.

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Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
Adhesives and sealants; Adhesives and sealants	Three different scenarios were assessed under this COU for three product types with differing use patterns: Wood flooring adhesives, concrete and masonry adhesives for small repairs, and small projects with seaming adhesive and a fire caulk. Of these 3 scenarios, concrete and masonry adhesives were assessed for dermal exposures only because these products are used outdoors, where the potential for inhalation and ingestion exposure is low. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025d) for number of products, product examples, and weight fraction data. For dermal exposure EPA used a dermal flux approach, which was estimated based on DIBP <i>in vitro</i> dermal absorption in rats. The flux-limited approach likely results in an overestimation of dose due to the assumption about excess DIBP in contact with skin. An overall moderate confidence in dermal assessment of adhesives was assigned. Uncertainties about the difference between human and rat skin absorption increase uncertainty. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides a representative dermal absorption for liquid products. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in a moderate overall confidence.	Inhalation – Robust Dermal – Moderate
Fabric, textile, and leather products not covered elsewhere; Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Five different scenarios were assessed under this COU for articles with differing use patterns: Indoor furniture and textiles; Children's clothing; Synthetic leather clothing for teenagers and adults; Variety of PVC articles with routine contact; and Footwear components. Indoor furniture articles were assessed for all exposure routes (inhalation, ingestion [suspended and settled dust, and mouthing], and dermal) as part of the indoor exposure assessment while the other scenarios were only assessed for dermal contact because the articles were too small to result in significant inhalation and ingestion exposures. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025d) for number of products, product examples, and weight fraction data. The indoor furniture ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates, and no reasonably available data to compare and confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has slight to moderate confidence in the exposure estimate	Inhalation – Robust Ingestion – Moderate Dermal – Slight to moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
	for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. Additionally, there are uncertainties associated with the flux-limited approach that likely result in an overestimation of dose due to the assumption about constant rate of absorption of DIBP in contact with skin. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use as well as surface area in contact are well understood and representative, resulting in an overall confidence of slight to moderate.	
Floor coverings; Floor coverings	Two different scenarios were assessed under this COU for articles with differing use patterns. The scenarios of vinyl flooring and carpet tiles were evaluated. Both scenarios were part of the indoor assessment and evaluated for all exposure routes except mouthing. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025d) for number of products, product examples, and weight fraction data. Ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates, and no reasonably available data to compare and confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has slight to moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. Additionally, there are uncertainties associated with the flux-limited approach, which likely results in an overestimation of dose due to the assumption about constant rate of absorption of DIBP in contact with skin. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of slight to moderate.	Inhalation – Robust Dust Ingestion – Moderate Dermal – Slight to moderate
Paints and coatings; Paints and coatings	One scenario was assessed for this COU, paints. The scenario was assessed for dermal exposures during application and direct dermal contact because inhalation and ingestion exposures were determined to be minimal due to small amount of product used and potential small surface area to release DIBP.	Dermal – Moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
	For dermal exposure EPA used a dermal flux approach, which was estimated based on DIBP <i>in vitro</i> dermal absorption in rats. The flux-limited approach likely results in an overestimation of dose due to the assumption about constant rate of absorption of DIBP in contact with skin. An overall moderate confidence in dermal assessment of adhesives was assigned. Uncertainties about the difference between human and rat skin absorption increase uncertainty. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides a representative dermal absorption for liquid products. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in a moderate overall confidence.	
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Seven different scenarios were assessed under this COU for articles with differing use patterns: air beds, car mats, in-place wallpaper, wallpaper installation, shower curtains, tire crumb and artificial turf, and variety PVC articles with routine contact (multiple examples). Air beds, car mats, in-place wallpaper, and shower curtains scenarios were considered in the indoor assessment for all exposure routes except mouthing, while wallpaper installation was assessed for dermal and inhalation for age groups above 10 years old and just inhalation for age groups under 10 years of age as bystanders of the installation process. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025d) for number of products, product examples, and weight fraction data. Ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates as well as no reasonably available data to compare and confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has slight to moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. Additionally, there are uncertainties associated with the flux-limited approach, which likely results in an overestimation of dose due to the assumption about constant rate of absorption of DIBP in contact with skin. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of slight to moderate.	Inhalation – Robust Ingestion – Moderate Dermal – Slight to moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
Toys, playground, and sporting equipment; Toys, playground, and sporting equipment	Four different scenarios were assessed under this COU for various articles with differing use patterns: legacy children’s toys, new children’s toys, tire crumb and artificial turf, and a variety of PVC articles with potential for routine contact. Toy scenarios were included in the indoor assessment for all exposure routes (inhalation, dust ingestion, mouthing, and dermal) with varying use patterns and inputs. Tire crumb was also part of the indoor assessment for all exposure routes except mouthing. Articles of semi-routine contact were only assessed for dermal exposures since they are too small to result in impactful inhalation or ingestion exposures. The high-, medium-, and low-intensity scenarios capture variability and provide a range of representative use patterns. The overall confidence in this COU’s inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025d) for location of use, number of products, product examples, and weight fraction data. Tire crumb inhalation confidence is moderate due to higher uncertainty in using surrogate chemical air concentrations, while all other parameters are well understood and representative of use patterns by the various age groups. The overall confidence in this COU’s mouthing and dermal exposure assessment is moderate. The mouthing parameters used like duration and surface area for infants to children are very well understood, while older groups have less specific information because mouthing behavior is not expected. The chemical migration rate value is DIBP specific, and the main sources of uncertainty are related to article formulation and chemical migration dynamics. Migration of the chemical to saliva may not be very well characterized, but by assessing high-, medium-, and low-intensity use exposure scenarios EPA increases confidence in the estimates by using representative scenarios. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has slight to moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. Additionally, there are uncertainties associated to the flux-limited approach, which likely results in overestimations due to the assumption about constant rate of absorption of DIBP in contact with skin. EPA is confident that the <i>in vitro</i> human dermal absorption data from Scott et al. (1987) provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of slight to moderate.	CEM Inhalation – Robust Ingestion, Tire Crumb Inhalation, – Moderate Dermal – Slight to moderate

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4.1.3 General Population Exposures

General population exposures occur when DIBP is released into the environment and the environmental media becomes a pathway for exposure. As described in the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025t) and summarized in Table 4-8 of this assessment, releases of DIBP are expected to occur to air, water, and land. Figure 4-1 provides a graphical representation of where and in which media DIBP is estimated to be found due to environmental releases and the corresponding route of exposure.

EPA began its DIBP general population exposure assessment using a screening level approach because of limited environmental monitoring data for DIBP and lack of location data for DIBP releases. A screening level analysis relies on conservative assumptions, including default input parameters for modeling exposure, to assess exposures that would be expected to be on the high end of the expected exposure distribution. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* (U.S. EPA, 2019c).

EPA evaluated the reasonably available information for releases of DIBP from facilities that use, manufacture, or process DIBP under industrial and/or commercial COUs subject to TSCA regulations detailed in the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025t). As described in Section 3.3, using the release data, EPA modeled concentrations of DIBP in surface water, sediment, drinking water, and ambient air in the United States. Table 3-8 summarizes the high-end DIBP concentrations in environmental media from environmental releases. The reason for assessing different pathways qualitatively or quantitatively is discussed briefly in Section 3.3, and additional detail can be found in *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025s).

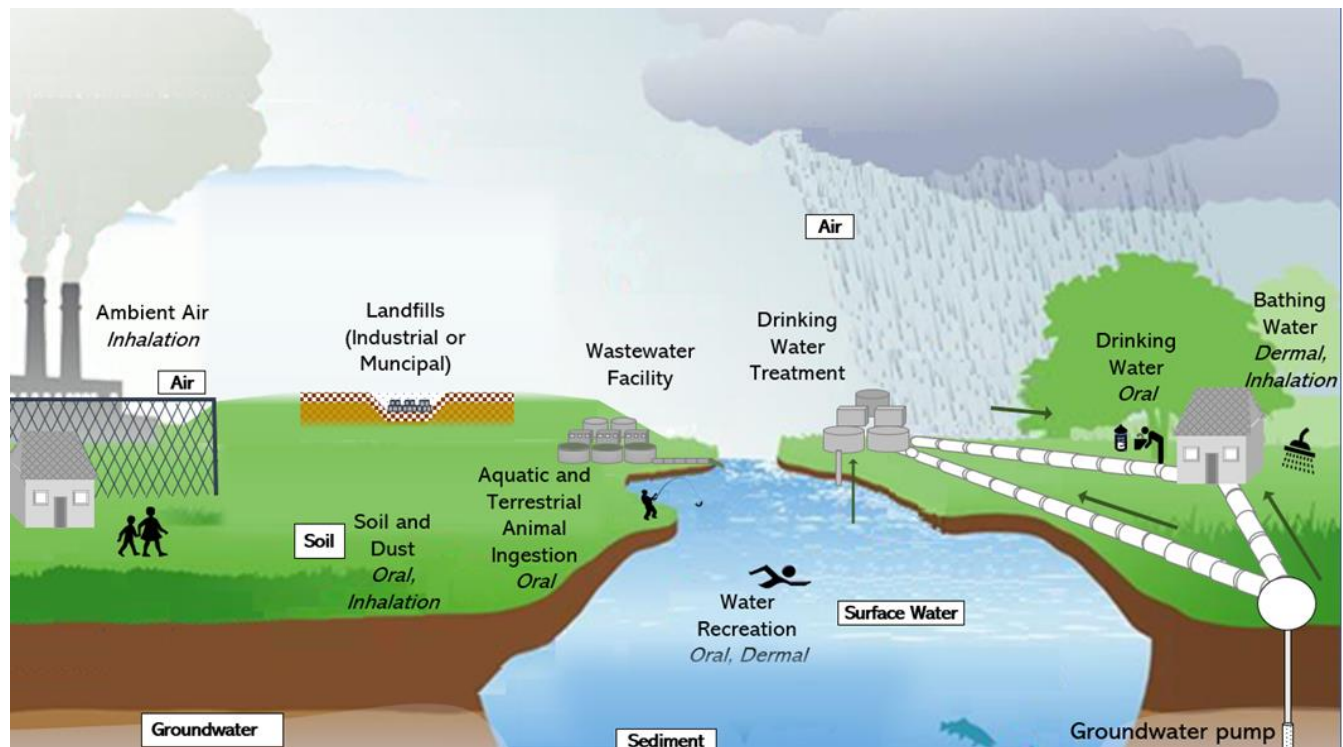


Figure 4-1. Potential Human Exposure Pathways to DIBP for the General Population

High-end estimates of DIBP concentration in the various environmental media presented in Table 3-8 and in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)) were used for screening level purposes in the general population exposure assessment. EPA's *Guidelines for Human Exposure Assessment* ([U.S. EPA, 2019c](#)) defines high-end exposure estimates as a "plausible estimate of individual exposure for those individuals at the upper end of an exposure distribution, the intent of which is to convey an estimate of exposure in the upper range of the distribution while avoiding estimates that are beyond the true distribution." If risk is not found for these individuals with high-end exposure, no risk is anticipated for central tendency exposures, which is defined as "an estimate of individuals in the middle of the distribution." Therefore, if there is no risk for an individual identified as having the potential for the highest exposure associated with a COU for a given pathway of exposure, then that pathway was determined not to be a pathway of concern and not pursued further. If any pathways were identified as a pathway of concern for the general population, further exposure assessments for that pathway would be conducted to include higher tiers of modeling when available, refinement of exposure estimates, and exposure estimates for additional subpopulations and OES/COUs.

Identifying individuals at the upper end of an exposure distribution included consideration of high-end exposure scenarios defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations. As described in Section 3.3, EPA focused on estimating high-end concentrations of DIBP from the largest estimated releases for the purpose of its screening level assessment for environmental and general population exposures. This means that the Agency considered the environmental concentration of DIBP in a given environmental medium resulting from the OES that had the highest release compared with all other OESs for the same releasing media. Release estimates from OES resulting in lower environmental media concentrations were not considered for this screening level assessment. Additionally, individuals with the greatest intake rate of DIBP per body weight were considered to be those at the upper-end of the exposure distribution.

Table 4-8 summarizes the high-end exposure scenarios that were considered in the screening level analysis including the lifestage assessed as the most potentially exposed population based on intake rate and body weight. Table 4-8 also indicates which pathways were evaluated quantitatively or qualitatively. Exposure scenarios were assessed quantitatively only when environmental media concentrations were quantified using estimated release data for the appropriate exposure scenario. Because DIBP concentration associated with environmental releases from biosolids and landfills (and therefore, resulting soil concentrations) were not quantified, exposure from soil or groundwater resulting from DIBP release to the environment via biosolids or landfills was not quantitatively assessed. Due to the high confidence in the biodegradation rates and physical and chemical data, there is robust confidence that DIBP will not be mobile and will have low persistence potential in receiving soils. Similarly, there is robust confidence that DIBP is unlikely to be present in landfill leachates. However, the scenarios were assessed qualitatively for exposures potentially resulting from biosolids and landfills. Further details on the screening level approach and exposure scenarios evaluated by EPA for the general population are provided in the *Draft Environmental Media, General Population, and Environmental Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). OESs resulting in the highest modeled environmental media concentrations were selected for the purpose of screening level analyses.

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OES ^a	Exposure Pathway	Exposure Route	Exposure Scenario	Lifestage ^b	Analysis (Quantitative or Qualitative)
All	Biosolids	All scenarios were assessed qualitatively			Qualitative
All	Landfills	All scenarios were assessed qualitatively			Qualitative
Plastic compounding	Surface water	Dermal	Dermal exposure to DIBP in surface water during swimming	Adult, youth, and children	Quantitative
		Oral	Incidental ingestion of DIBP in surface water during swimming	Adult, youth, and children	Quantitative
Plastic compounding	Drinking water	Oral	Ingestion of drinking water	Adult, youth, and children	Quantitative
All	Fish ingestion	Oral	Ingestion of fish for general population	Adult and young toddler ^c	Quantitative
Plastic compounding			Ingestion of fish for subsistence fishers	Adult	Quantitative
			Ingestion of fish for tribal populations	Adult	Quantitative
Plastic compounding (fugitive and stack)	Ambient air	Inhalation	Inhalation of DIBP in ambient air resulting from industrial releases	All	Quantitative
		Oral	Ingestion of soil from air to soil deposition resulting from industrial releases	Infants and Children	Quantitative

^a Table 3-1 provides a crosswalk of industrial and commercial COUs to OESs.
^b Adults (16+ years for fish ingestion, 20+ years for surface water), youths (11–15 years and 16–20 years), children (6–10 years), infants (birth to <1 years), toddlers (1–5 years)
^c Adult ingestion rates are for age groups 16+ years and young toddler are for 1 to <2 years. Only these 2 age groups were evaluated because young toddlers had the highest 90th percentile ingestion rate and adults had the highest 50th percentile ingestion rate.

1898 EPA also considered biomonitoring data, specifically urinary biomonitoring data from CDC's
1899 NHANES, to estimate exposure using reverse dosimetry (see Section 11 of EPA's *Draft Environmental*
1900 *Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA,](#)
1901 [2025s](#))). Reverse dosimetry modeling is a powerful tool for estimating exposure but does not distinguish
1902 between routes or pathways of exposure nor does it allow for source apportionment (i.e., exposure from
1903 TSCA COUs cannot be isolated from non-TSCA uses). Instead, reverse dosimetry provides an estimate
1904 of the total dose (or aggregate exposure) responsible for the measured biomarker. Therefore, intake
1905 doses estimated using reverse dosimetry are not directly comparable to the exposure estimates from the
1906 various environmental media presented in this assessment. However, the total intake dose estimated
1907 from reverse dosimetry can help contextualize the exposure estimates from exposure pathways outlined
1908 in Table 4-8 as being potentially underestimated or overestimated.
1909

4.1.3.1 General Population Screening Level Exposure Assessment Results

Land Pathway

EPA evaluated general population exposures via the land pathway (*i.e.*, application of biosolids, landfills) qualitatively. Regarding the application of biosolids, once in the soil, DIBP is expected to have a high affinity to soil ($\log K_{OC} = 2.67$) and organic media ($\log K_{OW} = 4.34$), which would limit mobility from biosolids or biosolid amended soils. Similarly, high sorption to particulates and organics would likely lead to high retardation, which would limit infiltration to and mobility within surrounding groundwater systems. DIBP is slightly soluble in water (6.2 mg/L) and has limited potential to leach from biosolids and infiltrate into deeper soil strata. However, it is not expected to migrate as far as groundwater given the minimum depth to groundwater required for biosolids agricultural applications stated in 40 CFR part 503. Since DIBP does have high hydrophobicity and a high affinity for soil sorption, it is unlikely that DIBP will migrate from potential biosolids-amended soils via groundwater infiltration. DIBP has been detected in surface runoff originating from landfills containing DIBP ([IARC, 2013](#)). However, the limited mobility and high sorption to soil suggests that infiltration of such stormwater runoff would be of minimal concern to deeper groundwater systems.

There are limited measured data on concentrations of DIBP in biosolids or soils receiving biosolids, and there is uncertainty that concentrations used in this analysis are representative of all types of environmental releases. However, the high-quality biodegradation rates and physical and chemical properties suggest that DIBP will have limited persistence potential and mobility in soils receiving biosolids.

Based on the biodegradation and hydrolysis data for conditions relevant to landfills, there is high confidence that DIBP will be persistent in landfills, but unlikely to be present in landfill leachates or to migrate through groundwater. However, there is currently no direct evidence that the general population or surrounding fauna are directly exposed to DIBP through refuse or waste disposed of through landfills. Although possible, there have been no data to suggest that DIBP is present in environmental compartments adjacent to landfills as the direct result of landfill operations.

Surface Water Pathway – Incidental Ingestion and Dermal Contact from Swimming

EPA conducted modeling of releases to surface water at the point of release (*i.e.*, in the immediate water body receiving the effluent) to estimate the resulting environmental media concentrations from TSCA COUs. EPA conducted modeling with EPA's Variable Volume Water Model with Point Source Calculator tool (VWWM-PSC) to estimate concentrations of DIBP within surface water and to estimate settled sediment in the benthic region of streams. Releases associated with the Plastic compounding OES resulted in the highest total water column concentrations, with 30Q5 water concentrations of 174 µg/L without wastewater treatment, and 55.7 µg/L when run under a conservative assumption of 68 percent wastewater treatment removal efficiency (Table 4-9). Because data on removal of DIBP in US wastewater treatment plants is limited, EPA selected a removal of 68 percent, which is the lower-end of reported median removal of DBP, which has been reported to be 68 to 98 percent within 50 WWTPs in the United States. ([U.S. EPA, 1982](#)). While a range of wastewater removal efficiencies were identified in the literature, the value of 68 percent removal was selected as a conservative removal value for U.S. WWTPs based on the discussion and confidence presented in the *Draft Fate Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025z](#)). Both treated and untreated scenarios were assessed due to uncertainty about the prevalence of wastewater treatment from discharging facilities and to demonstrate the hypothetical disparity in exposures between treated and untreated effluent in the generic release scenarios. COUs mapped to this OES are shown in Table 3-1. Although there is some uncertainty about the portion of these release estimates within this OES actually discharged to surface water, it is presented as a high-end screening analysis for general population exposure. These water column

concentrations were used to estimate the acute dose rate (ADR) and average daily dose (ADD) from dermal exposure and incidental ingestion of DIBP while swimming for adults (2+ years), youths (11–15 years), and children (6–10 years). Detailed results for all exposures can be found in *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). In this section exposure scenarios leading to the highest modeled dose are shown in Table 4-9.

For the purpose of a screening level assessment, EPA used a margin of exposure (MOE) approach using high-end exposure estimates to determine if exposure pathways were pathways of concern for potential non-cancer risks. MOEs for general population exposure through dermal exposure and incidental ingestion during swimming in untreated surface water for the most exposed lifestage were 2,800 and 6,120, respectively (compared with a benchmark of 30) (Table 4-9). Based on a screening level assessment, risks for non-cancer health effects are not expected for the surface water pathway; therefore, exposures due to incidental ingestion and dermal contact from swimming through the surface water pathway is not considered to be a pathway of concern with regards to the general population exposure to DIBP.

Surface Water Pathway – Drinking Water

For the drinking water pathway, modeled surface water concentrations were used to estimate drinking water exposures. For screening level purposes, only the OES scenario resulting in the highest modeled surface water concentrations, Plastic compounding, was included in the drinking water exposure analysis. COUs mapped to this OES are shown in Table 3-1. ADR and ADD values from drinking water exposure to DIBP were calculated for various age groups but the most exposed lifestage, infants (birth to <1 year), is shown in Table 4-9. Detailed results for all exposures can be found in *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). In this section exposure scenarios leading to the highest modeled dose for drinking water are shown in Table 4-9, which are for acute exposures to infants.

MOEs for general population exposure through drinking water was 232 (acute) for the drinking water scenario, even without considering wastewater or drinking water treatment, for the lifestage with the highest exposure (compared with a benchmark of 30) (Table 4-9). Based on screening level analysis, risk for non-cancer health effects is not expected for the drinking water pathway; therefore, the drinking water pathway is not considered to be a pathway of concern with regards to the general population exposure to DIBP.

Table 4-9. Summary of High-End General Population Surface Water and Drinking Water Exposure

OES ^a	Water Column Concentrations	Incidental Dermal Surface Water ^b		Incidental Ingestion Surface Water ^c		Drinking Water ^d	
	30Q5 Conc. (µg/L)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)
Plastic compounding ^a without wastewater treatment	174	2.04E-03	2,800	9.31E-04	6,120	2.46E-02	232
Plastic compounding ^a with wastewater treatment	55.7	6.51E-04	8,750	2.98E-04	19,100	7.86E-03	725

30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; MOE = margin of exposure; OES = occupational exposure scenario
^a Table 3-1 provides a crosswalk of industrial and commercial COUs to OES. Only this OES was used in the screening assessment because it resulted in the highest surface water concentrations.
^b Most exposed age group: adults (21+ years)
^c Most exposed age group: youths (11–15 years)
^d Most exposed age group: infants (birth to <1 year)

Fish Ingestion

The key parameters to estimate human exposure to DIBP via fish ingestion are the surface water concentrations, bioaccumulation factor (BAF), and fish ingestion rate. Surface water concentrations for DIBP associated with a particular COU were modeled using VVWM-PSC as described in Section 3.3.1.1. The harmonic mean flow and resulting estimated concentrations in surface water and fish tissue were applied to calculate exposure via fish ingestion because the harmonic mean flow is considered representative of long-term DIBP concentrations that would enter fish tissue over time. The details on the BAF, which considers the animal's uptake of a chemical from both diet and the water column, can be found in Section 7 of the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). Despite a low BAF, EPA considered fish ingestion exposure to the general population because of large estimated releases to water.

EPA evaluated exposure and potential risk to DIBP through fish ingestion for populations and age groups that had the highest fish ingestion rate per kg of body weight—including for adults and young toddlers in the general population, adult subsistence fishers, and adult Tribal populations. Children were not considered for reasons explained in Sections 7.2 and 7.3 of the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). Only the fish ingestion rate changes for these different populations; the surface water concentration and BAF remain the same. ADR and ADD values from fish ingestion exposure to DIBP were calculated for all populations and multiple age groups ([U.S. EPA, 2025s](#)), but Table 4-10 shows only the scenarios for Tribal populations as they represent the highest exposure because of their elevated fish ingestion rates compared to the general population and subsistence fisher populations. Exposure to Tribal populations were estimated based on a current mean ([U.S. EPA, 2011a](#)) and current 95th percentile ([Polissar et al., 2016](#)) fish ingestion rate. Current ingestion rate refers to the present-day consumption levels that are suppressed by contamination, degradation, or loss of access. Heritage rates existed prior to non-indigenous settlement on Tribal fishers' resources and changes to culture and lifeways. Therefore, current ingestion rates are considered more representative of contemporary rates of fish consumption and are presented below. Heritage rates are discussed in further detail in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)).

For the screening level analysis, EPA used DIBP's water solubility as an upper limit of DIBP concentration in surface water to estimate DIBP concentration in fish tissue. EPA also incorporated the highest modeled surface water concentrations based on releases by the Plastic compounding OES when refinements were needed. Conservative exposure estimates based on the water solubility limit resulted in screening level risk estimates below the benchmark. Therefore, EPA refined its evaluation by using modeled surface water concentrations that are based on the highest estimated 95th percentile release for the Plastic compounding OES, as well as the P50 harmonic mean flow from the harmonic mean distribution and without consideration of wastewater treatment. The more refined exposure estimates did not result in risk estimates below the benchmark for Tribal populations based on current mean and high-end (i.e., 95th percentile) fish ingestion rate. Therefore, EPA concludes that exposure to DIBP via fish ingestion is not a concern for the general population, subsistence fisher, or Tribal populations for Plastic compounding. Because MOEs were not below the benchmark for the Plastic compounding OES, which resulted in the highest exposure scenario, no other OES and their corresponding COUs are expected to result in risk estimates below the benchmark.

Table 4-10. Fish Ingestion for Adults in Tribal Populations Summary

Calculation Method	Current Mean Ingestion Rate (Benchmark MOE = 30)		Current 95th Percentile Ingestion Rate (Benchmark MOE = 30)	
	ADR/ADD (mg/kg-day)	Acute/Chronic MOE ^a	ADR/ADD (mg/kg-day)	Acute/Chronic MOE ^a
Water solubility limit (6.20 mg/L)	0.506	11	2.04	3
Modeled surface water concentration for Plastic compounding, P50 Harmonic Mean Flow, Without Wastewater Treatment (1.28E-01 mg/L)	9.87E-03	578	3.98E-02	143
ADR = acute dose rate; ADD = average daily dose; MOE = margin of exposure; POD = point of departure ^a Acute and chronic MOEs are identical because the exposure estimates and POD do not change between acute and chronic.				

Ambient Air Pathway

The ambient air exposure assessment utilized a previously peer-reviewed screening level analysis to evaluate exposures to the general population in proximity to releasing facilities, including fenceline communities. The approach used is described in EPA's *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities (Version 1.0)* ([U.S. EPA, 2022b](#)).

EPA used the Integrated Indoor/Outdoor Air Calculator (IIOAC) Model to estimate the high-end (95th percentile) and mean (50th percentile) daily and annual average concentrations across the modeled distribution of DIBP concentrations in ambient air to assess general population exposures at three distances from the release point (100, 100–1,000, and 1,000 m). The daily average concentration is the average of 24 consecutive, hourly modeled concentrations within each day modeled in IIOAC across 5 years of meteorological data modeled within IIOAC as described in the IIOAC Users Guide ([U.S. EPA, 2019f](#)). The annual average is a rolling 365-day average of all daily average concentrations across 5 years of meteorological data modeled within IIOAC. EPA also modeled the high-end (95th percentile) and mean (50th percentile) rolling annual average wet, dry, and total deposition rates of DIBP from the ambient air at three distances from the releasing facility (100, 100–1,000, and 1,000 m).

EPA used the highest daily releases (stack and fugitive) across all COUs from the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025t](#)) as direct inputs to the IIOAC Model to estimate concentrations and deposition rates. The highest daily

estimated releases were used to represent a high-end release value for acute, short-term exposures and risk estimates. EPA used the maximum 95th percentile modeled concentrations and deposition rates across a series of exposure scenarios considering particle size and urban/rural topography to characterize exposures and derive risk estimates. The 95th percentile values were used to capture a high-end exposure within the distribution of modeled results to better represent a peak concentration rather than a central tendency average concentration for acute exposures.

Calculations for general population exposure to ambient air via inhalation and ingestion from air to soil deposition for lifestages expected to be highly exposed based on exposure factors can be found in *Draft Ambient Air Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025a](#)). Inhalation exposure to DIBP from ambient air is expected to be much higher than exposure to DIBP via soil ingestion resulting from air to soil deposition and is, therefore, presented below for the screening level analysis.

The maximum EPA-estimated daily release value for fugitive and stack releases for DIBP was 8.82 kg/site-day and categorized under the “Plastic Compounding” OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). Since the release type is unknown, under the methodology used, EPA assumed the entire release was either all fugitive or all stack releases for this assessment and separately models the entire release as each type. EPA recognizes taking this either/or approach to release type means the modeled concentrations are not additive (as they cannot occur at the same time). However, for this screening level assessment, the Agency assumes the releases occurred at the same time to determine an upper-bound “total exposure” to DIBP attributable to both fugitive and stack releases. Although this captures the highest release of each type possible, it may overestimate total exposure of the general population to DIBP.

The highest 95th percentile modeled daily average concentration used to derive acute non-cancer risk estimates for fugitive releases was $16.68 \mu\text{g}/\text{m}^3$ and for stack releases was $0.91 \mu\text{g}/\text{m}^3$. These concentrations occurred at 100 m from the releasing facility and together result in a total exposure from facility releases of $17.59 \mu\text{g}/\text{m}^3$.

The highest 95th percentile modeled annual average concentration used to derive chronic risk estimates for fugitive releases was $15.81 \mu\text{g}/\text{m}^3$ and for stack releases was $0.64 \mu\text{g}/\text{m}^3$. These concentrations occurred at 100 m from the releasing facility and together result in a total exposure from facility releases of $16.45 \mu\text{g}/\text{m}^3$.

Table 4-11 summarizes the total exposures and the associated MOE calculated using the inhalation human equivalent concentration (HEC). The HEC is derived in the *Draft Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025w](#)) and is based on an 80 kg adult. Based on the 95th percentile air concentrations, MOEs for general population exposure through inhalation of ambient air are 1,762 for acute and 1,884 for chronic (compared to a benchmark of 30) for an adult. Because the HEC was derived for adults, MOEs for other lifestages were not calculated. However, considering similar or smaller inhalation rates for younger lifestages and greatest body weight difference of a factor of 16.7 between an adult (80 kg) and newborn (4.8 kg) based on EPA’s *Exposure Factors Handbook: 2011 Edition* ([U.S. EPA, 2011b](#)), MOEs for all lifestages will still exceed the benchmark based on the estimates for adults.

The risk estimates described in the preceding paragraph are derived from a highly conservative exposure scenario where such exposures to both fugitive and stack releases cannot physically occur at the same

time based on assumptions made around the releases and total exposure. Even under this highly conservative exposure scenario, the derived risk estimates are well above relative benchmarks for non-cancer health effects (greater than an order of magnitude). Therefore, EPA concludes exposure to DIBP via the ambient air pathway, inhalation route is not a concern for the general population for Plastic compounding OES. Because MOEs were not below the benchmark for the Plastic compounding OES, which resulted in the highest exposure scenario, no other OES and their corresponding COUs (Table 3-2, Table 4-11) are expected to result in risk estimates below the benchmark.

Table 4-11. Summary of High-End General Population Ambient Air Inhalation Exposure

OES ^a	Acute (Daily Average) ^b		Chronic (Annual Average) ^b	
	Air Concentration ^c (µg/m ³)	MOE ^d	Air Concentration ^c (µg/m ³)	MOE ^d
Plastic compounding (fugitive)	17.59	1,762	16.45	1,884
Application of paints and coatings without engineering controls (stack)				
MOE = margin of exposure; OES = occupational exposure scenario ^a Table 3-1 provides a crosswalk of industrial and commercial COUs to OESs. ^b EPA assumes the general population is continuously exposed (<i>i.e.</i> , 24 hours per day, 365/216 days per year) to outdoor ambient air concentrations. ^c Air concentrations are reported for the high-end (95th percentile) modeled value at 100 m from the emitting facility and stack plus fugitive releases combined. ^d Benchmark MOE = 30				

Based on the 95th percentile total annual particle deposition rate for DIBP, the MOE for the Oral HED is 225,351,863. Again, even under this highly conservative exposure scenario, the derived risk estimate is seven orders of magnitude greater than the benchmark MOE of 30. Therefore, EPA concludes that soil ingestion resulting from air to soil deposition is not a pathway of concern for the general population.

4.1.3.2 Daily Intake Estimates for the U.S. Population Using NHANES Urinary Biomonitoring Data

EPA used a screening level approach to calculate sentinel exposures to the general population from TSCA releases. EPA also analyzed urinary biomonitoring data from the CDC's NHANES dataset to provide context for aggregate exposures in the U.S. non-institutionalized civilian population. The NHANES dataset reports urinary concentrations for 15 phthalate metabolites specific to individual phthalate diesters. EPA analyzed data for one metabolite of DIBP; mono-isobutyl phthalate (MIBP) (measured in 2001–2018 NHANES cycles). Urinary metabolite levels reported in the most recent NHANES survey (i.e., 2017–2018) were used to calculate daily intake for various demographic groups reported within NHANES (Table 4-12). Median daily intake estimates across demographic groups ranged from 0.16 to 0.57 µg/kg-day, while 95th percentile daily intake estimates ranged from 0.49 to 2.12 µg/kg-day. The highest daily intake value estimated was for male toddlers (3 to <6 years old) and was 2.12 µg/kg-day at the 95th exposure percentile.

Detailed results of the NHANES analysis can be found in Section 11.1 of *Draft Environmental Media and General Population and Environmental Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)).

Using 50th and 95th percentile daily intake values calculated from reverse dosimetry, EPA calculated MOEs ranging from 10,000 to 36,000 at the 50th percentile and 2,700 to 12,000 at the 95th percentile

across demographic groups using the acute/intermediate/chronic POD (*i.e.*, an HED of 5,700 µg/kg-day) based on reduced fetal testicular testosterone (Table 4-13). The lowest calculated MOE of 2,700 was for male toddlers (3 to <6 years old), based on the 95th percentile exposure estimate. All calculated MOEs at the 50th and 95th percentiles were above the benchmark of 30, indicating that aggregate exposure to DIBP alone does not pose a risk to the non-institutionalized, U.S. civilian population.

General population exposure estimates calculated from exposure to ambient air, surface water, fish ingestion, and soil from TSCA releases are not directly analogous to daily intake values estimated via reverse dosimetry from NHANES. Although NHANES may be used to provide context for aggregate exposures in the U.S. population, NHANES is not expected to capture exposures from specific TSCA COUs that may result in high-dose exposure scenarios (*e.g.*, occupational exposures to workers), as compared with EPA’s general population exposure assessment, which evaluates sentinel exposures for specific exposure scenarios corresponding to TSCA releases. However, as a screening level analysis, media specific general population exposure estimates calculated herein were compared to daily intake values calculated using reverse dosimetry of NHANES biomonitoring data. Comparison of the values shows that many of the exposure estimates resulting from incidental dermal contact or ingestion of surface water (assuming no wastewater treatment) (Table 4-9) and ingestion of fish for adults (Table 4-10) from sentinel exposure scenarios exceed the total daily intake values estimated using NHANES (Table 4-12).

Exposure estimates for the general population via ambient air, surface water, and drinking water resulting from TSCA releases quantified in this document are likely overestimates. This is because exposure estimates from individual pathways exceed the total intake values calculated from NHANES measured even at the 95th percentile of the U.S. population for all ages. Further, this is consistent with the U.S. CPSC’s conclusion that DIBP exposure comes primarily from diet for women, infants, toddlers, and children and that the outdoor environment is not a major source of exposure to DIBP ([CPSC, 2014](#)). Thus, although the general population exposure estimates calculated using a screening level approach likely represent an overestimation of exposure, no MOEs for these sentinel exposures were below the benchmark MOE of 30, indicating no need for further refinement.

Table 4-12. Daily Intake Values and MOEs for DIBP Based on Urinary Biomonitoring from the 2017–2018 NHANES Cycle

Demographic	50th percentile Daily Intake (95% CI) (µg/kg-day)	95th percentile Daily Intake (95% CI) (µg/kg-day)	50th Percentile MOE (Benchmark = 30)	95th Percentile MOE (Benchmark = 30)
All	0.25 (0.23–0.28)	1.16 (0.97–1.35)	23,000	4,900
Females	0.26 (0.22–0.31)	0.96 (0.77–1.15)	22,000	5,900
Males	0.25 (0.21–0.28)	1.35 (1.01–1.69)	23,000	4,200
White non-Hispanic	0.24 (0.2–0.29)	0.99 (0.74–1.23)	24,000	5,800
Black non-Hispanic	0.24 (0.2–0.29)	1.38 (1.05–1.71)	24,000	4,100
Mexican-American	0.25 (0.21–0.29)	1.13 (0.52–1.73)	23,000	5,000
Other	0.28 (0.23–0.34)	1.23 (0.83–1.63)	20,000	4,600
Above poverty level	0.31 (0.25–0.37)	1.1 (0.77–1.43)	18,000	5,200
Below poverty level	0.25 (0.21–0.28)	1.16 (0.9–1.41)	23,000	4,900
Toddlers (3 to <6 years old)	0.51 (0.45–0.57)	1.98 (1.42–2.54)	11,000	2,900
Children (6 to <11 years old)	0.32 (0.26–0.37)	1.19 (0.68–1.71)	18,000	4,800

Demographic	50th percentile Daily Intake (95% CI) (µg/kg-day)	95th percentile Daily Intake (95% CI) (µg/kg-day)	50th Percentile MOE (Benchmark = 30)	95th Percentile MOE (Benchmark = 30)
Adolescents (12 to <16 years old)	0.2 (0.17–0.23)	0.86 (0.35–1.37)	29,000	6,600
Adults (16+ years old)	0.19 (0.16–0.22)	0.59 (0.23–0.96)	30,000	9,700
Male toddlers (3 to <6 years old)	0.57 (0.48–0.65)	2.12 (1.56–2.67)	10,000	2,700
Male children (6 to <11 years old)	0.33 (0.26–0.39)	1.62 (0.69–2.56)	17,000	3,500
Male adolescents (12 to <16 years old)	0.21 (0.18–0.23)	0.59 (0.12–1.05)	27,000	9,700
Male adults (16+ years old)	0.16 (0.12–0.21)	0.49 (–0.03 to 1)	36,000	12,000
Female toddlers (3 to <6 years old)	0.4 (0.33–0.47)	1.52 (0.53–2.51)	14,000	3,800
Female children (6 to <11 years old)	0.31 (0.23–0.38)	0.88 (0.32–1.44)	18,000	6,500
Female adolescents (12 to <16 years old)	0.18 (0.09–0.27)	0.86 ^a	32,000	6,600
Females of reproductive age (16–49 years old)	0.2 (0.15–0.25)	0.57 ^a	29,000	10,000
Female adults (16+ years old)	0.25 (0.23–0.28)	1.16 (0.97–1.35)	23,000	4,900
^a 95% confidence intervals (CI) could not be calculated due to small sample size or a standard error of 0.				

4.1.3.3 Overall Confidence in General Population Screening Level Exposure Assessment

The weight of scientific evidence supporting the general population exposure to environmental releases estimate is decided based on the strengths, limitations, and uncertainties associated with the exposure estimates, which are discussed in detail for ambient air, surface water, drinking water, and fish ingestion in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). EPA summarized its weight of scientific evidence using confidence descriptors: robust, moderate, slight, or indeterminate. The Agency used general considerations (*i.e.*, relevance, data quality, representativeness, consistency, variability, and uncertainties) as well as chemical-specific considerations for its weight of scientific evidence conclusions.

EPA determined robust confidence in its qualitative assessment of biosolids and landfills. For its quantitative assessment for surface water, drinking water, ambient air, and fish ingestion, the Agency modeled exposure due to various general population and environmental release exposure scenarios resulting from different pathways of exposure. Exposure assessments used high-end inputs for the purpose of risk screening. When available, monitoring data were compared to modeled estimates to evaluate overlap, magnitude, and trends. Available monitoring data are presented in *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). The Agency has robust confidence that EPA-estimated releases and exposure scenarios used are appropriately conservative for a screening level-analysis. Therefore, EPA has robust confidence that no exposure scenarios will lead to greater doses than presented in this draft risk evaluation. Furthermore, many of the acute dose rates or average daily doses from a single exposure scenario exceed the total daily intake values estimated in Section 4.1.3.2 using NHANES data adding

further confidence that the exposure estimates captured high-end exposure scenarios and were appropriately conservative. Despite moderate confidence in the estimated values themselves, confidence in exposure estimates capturing upper-bound exposure scenarios was robust given the conservative assumptions used for the estimates.

4.1.4 Human Milk Exposures

Infants are a potentially susceptible population for various reasons including their higher exposure per body weight, immature metabolic systems, and the potential for chemical toxicants to disrupt sensitive developmental processes. Reasonably available information from studies of experimental animal models also indicates that DIBP is a developmental and reproductive toxicant ([U.S. EPA, 2025s](#)). EPA considered exposure and hazard information, as well as pharmacokinetic models, to determine the most appropriate approach to evaluate infant exposure to DIBP from human milk ingestion.

EPA identified eight biomonitoring studies, of which one is a U.S. study, from reasonably available information that investigated if DIBP or its metabolites were present in human milk. In the U.S. study, DIBP's primary metabolite, mono-isobutyl phthalate (MIBP) was measured in 21 samples collected in the Mother's Milk Bank in California. The concentrations ranged from 0.10 to 132.7 ng/g lipid weight with a mean concentration of 23.88 ng/g ([Hartle et al., 2018](#)). It is important to note that biomonitoring data do not distinguish between exposure routes or pathways and do not allow for source apportionment. In other words, biomonitoring data reflect total infant exposure through human milk ingestion and the contribution of specific TSCA COUs to overall exposure cannot be determined.

Although EPA explored the potential to model milk concentrations and concluded that there is insufficient information (*e.g.*, sensitive and specific half-life data) available to support modeling of the milk pathway, the Agency also concluded that modeling is not needed to adequately evaluate risks associated with exposure through milk. This is because the POD used in this assessment is based on male reproductive effects resulting from maternal dosing throughout sensitive phases of development (*i.e.*, gestation and perinatal exposure). Because these values designed to be protective of infants are expressed in terms of maternal exposure levels and hazard values to assess direct exposures to infants are unavailable, EPA concluded that further characterization of infant exposure through human milk ingestion would not be informative. The Agency therefore has confidence that the risk estimates calculated based on maternal exposures are protective of a nursing infant. Further discussion of the human milk pathway is provided in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)).

4.1.5 Aggregate and Sentinel Exposure

TSCA section 6(b)(4)(F)(ii) (15 U.S.C. § 2605(b)(4)(F)(ii)) requires EPA, in conducting a risk evaluation, to describe whether aggregate and sentinel exposures under the COUs were considered and the basis for their consideration.

EPA defines aggregate exposure as “the combined exposures to an individual from a chemical substance across multiple routes and across multiple pathways (40 CFR 702.33).” For the draft DIBP risk evaluation, the Agency considered aggregate risk across all routes of exposure for each individual consumer and occupational COU evaluated for acute, intermediate, and chronic exposure durations. EPA did not consider aggregate exposure for the general population exposed to environmental releases. As described in Section 4.1.3, the Agency employed a risk screen approach for the general population exposure assessment. Based on results from the risk screen, no pathways of concern (*i.e.*, ambient air, surface water, drinking water, fish ingestion) to DIBP exposure were identified for the general population.

EPA did not consider aggregate exposure scenarios across COUs because the Agency did not find any evidence to support such an aggregate analysis based on the reasonably available information, such as statistics of populations using certain products represented across COUs or workers performing tasks across COUs. However, EPA considered combined exposure across all routes of exposure for each individual occupational and consumer COU to calculate aggregate risks (Sections 4.3.2 and 4.3.3).

EPA defines sentinel exposure as “the exposure to a chemical substance that represents the plausible upper bound of exposure relative to all other exposures within a broad category of similar or related exposures (40 CFR 702.33).” In terms of this draft risk evaluation, EPA considered sentinel exposures by considering risks to populations who may have higher exposures; for example, workers and ONUs who perform activities with higher exposure potential, or consumers who have higher exposure potential or certain physical factors like body weight or skin surface area exposed. The Agency characterized high-end exposures in evaluating exposure using both monitoring data and modeling approaches. Where statistical data are available, EPA typically uses the 95th percentile value of the available dataset to characterize high-end exposure for a given COU. For general population and consumer exposures, the Agency occasionally characterized sentinel exposure through a “high-intensity use” category based on elevated consumption rates, breathing rates, or user-specific factors.

4.2 Summary of Human Health Hazard

4.2.1 Background

This section briefly summarizes the non-cancer and cancer human health hazards of DIBP (Section 4.2.2 and 4.2.3). Additional information on the non-cancer and cancer human health hazards of DIBP is provided in the *Draft Non-cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025w](#)) and *Draft Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* ([U.S. EPA, 2025b](#)).

4.2.2 Non-Cancer Human Health Hazards of DIBP

The majority of toxicokinetic data for DIBP is derived from oral exposure studies; reasonably available data on other routes of exposure are sparse. A human biomonitoring study conducted by Koch et al. ([2012](#)) investigated the metabolism of DIBP following oral exposure and results indicate that DIBP is absorbed across the gastrointestinal tract and metabolized to monoisobutyl phthalate (MIBP); 2OH-MIBP; and 3OH-MIBP. Most of the administered dose of DIBP and its metabolites were excreted in urine within 24 hours. As stated in Section 2 of the *Draft Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025w](#)), EPA will conservatively assume an oral absorption of 100 percent and an inhalation absorption of 100 percent. The Agency is therefore proposing to use surrogate dermal absorption data from an *in vitro* study by Scott et al. ([1987](#)) of DBP, a structurally and toxicologically similar phthalate, to estimate the dermal flux of DIBP, as further described in the Occupational Exposures (Section 4.1.1) and Consumer Exposures (Section 4.1.2) summaries.

EPA identified effects on the developing male reproductive system as the most sensitive and robust non-cancer hazard associated with oral exposure to DIBP in experimental animal models. Existing assessments of DIBP also identified effects on the developing male reproductive system as the most sensitive and robust non-cancer effect following oral exposure to DIBP. Existing assessments included those by U.S. CPSC ([CPSC, 2014, 2011](#)), Health Canada ([Health Canada, 2020](#); [EC/HC, 2015](#)), ECHA ([2017a, b](#)), and NICNAS ([NICNAS, 2008a](#))—as well as a systematic review by Yost et al., ([2019](#)) that drew conclusions consistent with those of the aforementioned regulatory bodies. EPA also considered

epidemiologic evidence qualitatively as part of hazard identification and characterization. However, epidemiologic evidence for DIBP was not considered further for dose-response analysis due to uncertainty associated with exposure characterization of individual phthalates, including source or exposure and timing of exposure as well as co-exposure confounding with other phthalates, discussed in Section 1.1 of *Draft Non-cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025w). The epidemiological studies provide qualitative support as part of the weight of scientific evidence. This use of epidemiologic evidence qualitatively is consistent with phthalates assessment by Health Canada, U.S. CPSC, NICNAS, and ECHA.

EPA identified 13 oral exposure studies (11 of rats, 2 of mice) that have investigated the developmental and reproductive effects of DIBP following gestational and/or perinatal exposure to DIBP (Gray et al., 2021; Pan et al., 2017; Saillenfait et al., 2017; Wang et al., 2017; Sedha et al., 2015; Furr et al., 2014; Hannas et al., 2012; Hannas et al., 2011; Howdeshell et al., 2008; Saillenfait et al., 2008; BASF, 2007; Borch et al., 2006; Saillenfait et al., 2006). No one- or two-generation reproduction studies of DIBP are available for any route of exposure. Across available studies, the most sensitive developmental effects identified by EPA include effects on the developing male reproductive system consistent with a disruption of androgen action and the development of phthalate syndrome. As stated in Section 4.2.3 of the *Draft Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025w), EPA is proposing a POD of 24 mg/kg-day (human equivalent dose [HED] of 5.7 mg/kg-day) based on phthalate syndrome-related effects on the developing male reproductive system (i.e., decreased fetal testicular testosterone) to estimate non-cancer risks from oral exposure to DIBP for acute, intermediate, and chronic durations of exposure in the draft risk evaluation of DIBP. The proposed POD was derived from benchmark dose (BMD) modeling of *ex vivo* fetal testicular testosterone data and supports a 95 percent lower confidence limit on the BMD associated with a benchmark response (BMR) of 5 percent (BMDL₅) of 24 mg/kg-day (Gray et al., 2021) (Table 4-13).

The Agency has performed $\frac{3}{4}$ -body weight scaling to yield the HED and is applying the animal to human extrapolation factor (i.e., interspecies extrapolation; UF_A) of 3× and a within human variability extrapolation factor (i.e., intraspecies extrapolation; UF_H) of 10×. Thus, a total uncertainty factor (UF) of 30× is applied for use as the benchmark MOE. Based on the strengths, limitations, and uncertainties discussed Section 4.3 of the *Draft Non-cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025w), EPA reviewed the weight of scientific evidence and has *robust overall confidence in the proposed POD based on decreased fetal testicular testosterone for use in characterizing risk from exposure to DIBP for acute, intermediate, and chronic exposure scenarios*. The applicability and relevance of this POD for all exposure durations (acute, intermediate, and chronic) is described in the introduction to Section 4 and Appendix B of the *Draft Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025w). For purposes of assessing non-cancer risks, the selected POD is considered most applicable to females of reproductive age, pregnant women, and male infants. Use of this POD to assess risk for other age groups (e.g., older children, adult males, and the elderly) is considered to be conservative and appropriate for a screening level assessment for these other age groups.

No data are reasonably available for the dermal or inhalation routes that are suitable for deriving route-specific PODs. Therefore, EPA is using the acute/intermediate/chronic oral POD to evaluate risks from dermal and inhalation exposure to DIBP. For the dermal route, differences in absorption are being accounted for in dermal exposure estimates in the draft risk evaluation for DIBP. For the inhalation route, the Agency is extrapolating the oral HED to an inhalation HEC per EPA's *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (U.S. EPA, 1994) using the updated human body weight and breathing rate relevant to continuous exposure of an

individual at rest provided in EPA's *Exposure Factors Handbook: 2011 Edition* ([U.S. EPA, 2011b](#)). The oral HED and inhalation HEC values selected by EPA to estimate non-cancer risk from acute/intermediate/chronic exposure to DIBP in the draft risk evaluation of DIBP are summarized in Table 4-13.

Table 4-13. Non-Cancer HED and HEC Used to Estimate Risks

Exposure Scenario	Target Organ System	Species	Duration	POD (mg/kg-day)	Effect	HED (mg/kg-day)	HEC (mg/m ³) [ppm]	Benchmark MOE	Reference (TSCA Study Quality Rating)
Acute, intermediate, chronic	Developmental toxicity	Rat	4 days during gestation (GDs 14–18)	BMDL ₅ = 24	↓ <i>ex vivo</i> fetal testicular testosterone production	5.7	30.9 [2.71]	UF _A = 3 ^a UF _H = 10 Total UF = 30	(Gray et al., 2021) (High)

HEC = human equivalent concentration; HED = human equivalent dose; MOE = margin of exposure; NOAEL = no-observed-adverse-effect level; POD = point of departure; UF = uncertainty factor
^a EPA used allometric body weight scaling to the ¾-power to derive the HED. Consistent with EPA guidance ([U.S. EPA, 2011c](#)), the UF_A was reduced from 10 to 3×.

4.2.3 Cancer Human Health Hazards of DIBP

DIBP has not been evaluated for carcinogenicity in any 2-year cancer bioassays. EPA therefore evaluated the utility of read-across approaches to assess potential cancer hazards of DIBP based on cancer bioassays and MOA information available for other phthalates being evaluated under TSCA (*i.e.*, DEHP, DBP, BBP, DCHP, DINP, DIDP) as discussed in the *Draft Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* ([U.S. EPA, 2025b](#)).

EPA used elements of the Rethinking Chronic Toxicity and Carcinogenicity Assessment for Agrochemicals Project (ReCAAP) weight of evidence framework ([Hilton et al., 2022](#)) to determine the need for carcinogenicity studies for DIBP. The framework takes into consideration multiple lines of evidence to support decision-making for the chemical(s) of interest—including information pertaining to nomenclature, physical and chemical properties; exposure and use patterns; absorption, distribution, metabolism, and excretion (ADME) properties; and toxicological data (*e.g.*, genetic toxicity, acute toxicity, subchronic toxicity, hormone perturbation, immunotoxicity, and mode of action). The framework was developed by a workgroup comprising scientists from academia, government (including EPA), non-governmental organizations, and industry stakeholders.

Recently, the Organisation for Economic Co-operation and Development (OECD) developed several Integrated Approach to Testing and Assessment (IATA) case studies demonstrating applicability of the weight of evidence framework ([OECD, 2024](#)). As part of this weight of evidence approach, human health hazard profiles for DIBP were evaluated and compared to profiles for five read-across chemicals, including DEHP, DBP, BBP, DINP, and DIDP (also referred to as “read-across phthalates” in this document). Overall, based on the weight of scientific evidence, EPA has preliminarily concluded that the non-cancer POD for DIBP based on effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome that was selected for characterizing risk from acute, intermediate, and chronic exposure to DIBP is appropriate for use in human health risk assessment and is protective of human health, including for PESS ([U.S. EPA, 2025b, w](#)). Furthermore, as discussed in the draft cancer human health hazard assessment ([U.S. EPA, 2025b](#)) EPA preliminarily

concludes that potential carcinogenicity of DIBP is not a significant remaining source of uncertainty in the quantitative and qualitative risk characterization, despite the lack of carcinogenicity bioassays for DIBP. Further, these preliminary conclusions are based on two key weight of scientific evidence considerations that will be explained in the following paragraph.

First, DIBP is toxicologically similar to DEHP, DBP, BBP, DINP, and DCHP and can induce antiandrogenic effects and disrupt fetal testicular testosterone biosynthesis in rats leading to a spectrum of effects on the developing male reproductive system consistent with phthalate syndrome. Second, for the five read-across phthalates, effects on the developing male reproductive system consistent with phthalate syndrome was the most sensitive and robust endpoint for deriving PODs for use in characterizing risk for acute, intermediate, and chronic exposure scenarios. The only exception to this was for DINP, in which chronic non-cancer liver effects were identified as a more sensitive outcome than developmental toxicity for deriving a chronic POD. Finally, EPA has determined that quantitative cancer risk assessment is not needed for the read-across phthalates DEHP, DINP, DIDP, DBP, or BBP ([U.S. EPA, 2025b](#)).

4.3 Human Health Risk Characterization

4.3.1 Risk Assessment Approach

The exposure scenarios, populations of interest, and toxicological endpoints used for evaluating risks from acute, short-term/intermediate, and chronic/lifetime exposures are summarized in Table 4-14.

Table 4-14. Exposure Scenarios, Populations of Interest, and Hazard Values

Population of Interest and Exposure Scenario	Workers Male and female adolescents and adults (16+ years) and females of reproductive age directly working with DIBP under light activity (breathing rate of 1.25 m ³ /h) (for further details see (U.S. EPA, 2025t)) <u>Exposure Durations</u> - Acute – 8 hours for a single workday - Intermediate – 8 hours per workday for 22 days per 30-day period - Chronic – 8 hours per workday for 250 days per year for 31 or 40 working years <u>Exposure Routes</u> - Inhalation and dermal
	Occupational Non-Users Male and female adolescents and adults (16+ years old) indirectly exposed to DIBP within the same work area as workers (breathing rate of 1.25 m ³ /h) (for further details see (U.S. EPA, 2025t)) <u>Exposure Durations</u> - Acute, Intermediate, and Chronic – same as workers <u>Exposure Routes</u> - Inhalation, dermal (mist and dust deposited on surfaces)
	Consumers Male and female infants (<1 year), toddlers (1–2 years), children (3–5 years and 6–10 years), young teens (11–15 years), teenagers (16–20 years) and adults (21+ years) exposed to DIBP through product or article use (for further details see (U.S. EPA, 2025d)) <u>Exposure Frequency</u> - Acute – 1 day exposure - Intermediate – 30 days per year - Chronic – 365 days per year <u>Exposure Routes</u> - Inhalation, dermal, and oral

Population of Interest and Exposure Scenario	Bystanders Male and female infants (<1 year), toddlers (1–2 years), and children (3–5 years and 6–10 years) incidentally exposed to DIBP through product use (for further details see (U.S. EPA, 2025d)) <u>Exposure Frequency</u> • <i>Acute</i> – 1 day exposure • <i>Intermediate</i> – 30 days per year • <i>Chronic</i> – 365 days per year <u>Exposure Routes</u> • Inhalation
	General Population Male and female infants, children, youth, and adults exposed to DIBP through drinking water, surface water, ambient air, and fish ingestion (for further details see (U.S. EPA, 2025s)) <u>Exposure Durations</u> • <i>Acute</i> – Exposed to DIBP continuously for a 24-hour period • <i>Chronic</i> – Exposed to DIBP continuously for up to 78 years <u>Exposure Routes</u> • Inhalation, dermal, and oral (depending on exposure scenario)
	Cumulative Exposure Based on NHANES Biomonitoring Children aged 3–5, 6–11 years, and 11 to <16 years; male and female adults 16+ years; and females of reproductive age (16–49 years of age) exposed to DEHP, DBP, BBP, DIBP, and DINP through all exposure pathways and routes as measured through urinary biomonitoring (<i>i.e.</i>, NHANES) (for further details see (U.S. EPA, 2025ad)) <u>Exposure Durations</u> • Durations not easily characterized in urinary biomonitoring studies • Likely between acute and intermediate as phthalates have elimination half-lives on the order of several hours and are quickly excreted from the body in urine. Spot urine samples, as collected through NHANES, are representative of relatively recent exposures. <u>Exposure Routes</u> • NHANES urinary biomonitoring data provides an estimate of aggregate exposure (<i>i.e.</i>, exposure through oral, inhalation, and dermal routes)
Health Effects, Concentration and Time Duration	Non-Cancer Acute/Intermediate/Chronic Value Sensitive health effect: Developmental toxicity (<i>i.e.</i>, effects on the developing male reproductive system; <i>i.e.</i>, decreased fetal testicular testosterone) (for further details see (U.S. EPA, 2025w)) HEC Daily, continuous = 30.9 mg/m³ (2.71 ppm) HED Daily = 5.7 mg/kg-day; dermal and oral Total UF (benchmark MOE) = 30 (UF_A = 3; UF_H = 10) Hazard Relative Potency Relative potency factors for DEHP, DBP, BBP, DIBP, DCHP, and DINP were derived based on reduced fetal testicular testosterone. DBP was selected as the index chemical (for further details see (U.S. EPA, 2025ad)). RPF_{DEHP} = 0.84 RPF_{DBP} = 1 (index chemical) RPF_{BBP} = 0.52 RPF_{DIBP} = 0.53 RPF_{DCHP} = 1.66 RPF_{DINP} = 0.21 Index chemical (DBP) POD = HED Daily = 2.1 mg/kg-day Total UF (benchmark MOE) = 30 (UF_A = 3; UF_H = 10)

4.3.1.1 Estimation of Non-Cancer Risks from Exposure to DIBP

EPA used a margin of exposure (MOE) approach to identify potential non-cancer risks for individual exposure routes (*i.e.*, oral, dermal, and inhalation). The MOE is the ratio of the non-cancer POD divided by a human exposure dose. Acute, short-term, and chronic MOEs for non-cancer inhalation and dermal risks were calculated using Equation 4-1.

Equation 4-1. Margin of Exposure Calculation

$$MOE = \frac{\text{Non - Cancer Hazard Value (POD)}}{\text{Human Exposure}}$$

Where:

<i>MOE</i>	=	Margin of exposure for acute, intermediate, or chronic risk comparison (unitless)
<i>Non-Cancer Hazard Value (POD)</i>	=	HEC (mg/m ³) or HED (mg/kg-day)
<i>Human Exposure</i>	=	Exposure estimate (mg/m ³ or mg/kg-day)

MOE risk estimates may be interpreted in relation to benchmark MOEs. Benchmark MOEs are typically the total UF for each non-cancer POD. The MOE estimate is interpreted as a human health risk of concern if the MOE estimate is less than the benchmark MOE (i.e., the total UF). On the other hand, if the MOE estimate is equal to or exceeds the benchmark MOE, the risk is not considered to be of concern and mitigation is not needed. Typically, the larger the MOE, the more unlikely it is that a non-cancer adverse effect occurs relative to the benchmark. When determining whether a chemical substance presents unreasonable risk to human health or the environment, calculated risk estimates are not “bright-line” indicators of unreasonable risk, and EPA has the discretion to consider other risk-related factors in addition to risks identified in the risk characterization.

4.3.1.2 Estimation of Non-Cancer Aggregate Risks from Exposure to DIBP

As described in Section 4.1.5, EPA considered aggregate risk from exposure to DIBP across all routes of exposure for each individual consumer and occupational COU evaluated for acute, intermediate, and chronic exposure durations. To identify potential non-cancer risks for aggregate exposure scenarios for workers (Section 4.3.2) and consumers (Section 4.3.3), EPA used the total MOE approach ([U.S. EPA, 2001](#)). For the total MOE approach, MOEs for each exposure route of interest in the aggregate scenario must first be calculated. The total MOE for the aggregate scenario can then be calculated using Equation 4-2.

Equation 4-2. Total Margin of Exposure Calculation

$$\text{Total MOE} = \frac{1}{\frac{1}{MOE_{Oral}} + \frac{1}{MOE_{Dermal}} + \frac{1}{MOE_{Inhalation}} \dots}$$

Where:

<i>Total MOE</i>	=	Margin of exposure for aggregate scenario (unitless)
<i>MOE_{Oral}</i>	=	Margin of exposure for oral route (unitless)
<i>MOE_{Dermal}</i>	=	Margin of exposure for dermal route (unitless)
<i>MOE_{Inhalation}</i>	=	Margin of exposure for inhalation route (unitless)

Total MOE risk estimates may be interpreted in relation to benchmark MOEs, as described in Section 4.3.1.1.

4.3.2 Risk Estimates for Workers

Risk estimates for workers from inhalation and dermal exposures, as well as aggregated exposures, are shown in Table 4-16. This section provides a summary and characterization of risk estimates for workers, including females of reproductive age and ONUs, for the various OESSs. As discussed in

Section 4.1.1.4, the weight of scientific evidence is moderate in the case of the assessed inhalation in general with the exception of the high-end inhalation exposures in the case of the spray application of paints and coatings, in which case the weight of scientific evidence is slight. Regarding the weight of scientific evidence for occupational dermal exposure estimates, EPA has moderate confidence that the dermal exposure estimates presented in Table 4-4 are representative for liquid contact and the estimates serve as an upper bound for exposure to solid materials containing DIBP (e.g., scenarios with only dust exposure). EPA does not currently have reasonably available information regarding use of personal protective equipment (PPE) under the COUs, and therefore these exposure estimates do not reflect use of PPE. Any additional information received during the public comment period on current PPE practices would be considered in the final risk evaluation.

Application of Paints and Coatings

With regard to the spray application of paints and coatings, inhalation exposures contribute to risk in the case of high-end exposures. With regard to high-end acute, intermediate and chronic exposures to workers who are average adults or females of reproductive age, MOEs are in the range of 1.9 to 3 in the case of inhalation exposure and in the range of 761 to 1,209 in the case of dermal exposure. Similarly, with regard to the central tendency exposures, MOEs are in the range of 122 to 197 in the case of inhalation exposure and in the range of 1,522 to 2,419 in the case of dermal exposure. With regard to ONUs, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark.

With regard to the non-spray application of paints and coatings, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark. With regard to inhalation exposure, MOEs in general are in the range of 2,256 to 16,644. With regard to dermal exposure, MOEs are in the range of 761 to 2,419 in the case of central tendency and high-end acute, intermediate and chronic exposures of workers who are average adults or females of reproductive age.

Based on the limitations, strengths and uncertainties of the assessment of inhalation exposures, which are discussed in Table 4-5, EPA concludes that the results of the inhalation assessment are likely conservative. As discussed in Table 4-5, there is uncertainty about the high-end concentration of DIBP in paints and coating products. MOEs are inversely proportional to this concentration and therefore lower concentrations result in higher MOEs. Furthermore, the assessment of the spray application of paints and coatings involves surrogate monitoring data. As discussed in Appendix D.13.2.1 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate* ([U.S. EPA, 2025t](#)), these monitoring data are associated with three types of spray booths (downdraft, cross draft, or semi-downdraft) and two types of spray guns (conventional or high-volume low-pressure). The central tendency and high-end values of these monitoring data are not associated with any particular type of spray booth or spray gun.

As discussed in Table 4-5, EPA's confidence in the high-end value of inhalation exposure assessed in the case of the spray application of paints and coatings is slight because of uncertainty about the high-end value of the concentrations of DIBP in paints and coatings products.

Application of Adhesives and Sealants

With regard to the spray application of adhesives and sealants, inhalation exposures contribute to risk in the case of both high-end and central tendency exposures. With regard to high-end acute, intermediate and chronic exposures to workers who are average adults or females of reproductive age, MOEs are in the range of 1.9 to 3 in the case of inhalation exposure and in the range of 761 to 1,209 in the case of dermal exposure. Similarly, with regard to the central tendency exposures, MOEs are in the range of 20 to 35 in the case of inhalation exposure and in the range of 1,522 to 2,606 in the case of dermal

exposure. With regard to ONUs, all MOEs associated with dermal exposure exceed the MOE benchmark; however, MOEs associated with inhalation exposure to ONUs range from 22 to 35 for estimates across acute, intermediate, and chronic levels of inhalation exposure.

With regard to the non-spray application of adhesives and sealants, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark. With regard to inhalation exposure, MOEs in general are in the range of 2,256 to 17,935. With regard to dermal exposure, MOEs are in the range of 761 to 2,606 in the case of central tendency and high-end acute, intermediate and chronic exposures of workers who are average adults or females of reproductive age.

Based on the limitations, strengths and uncertainties of the assessment of inhalation exposures discussed in Table 4-5, EPA concludes that the results of the inhalation assessment are likely conservative. As discussed in Table 4-5, there is uncertainty that adhesive and sealant products containing DIBP are spray-applied. Furthermore, the assessment of the spray application of adhesives and sealants involves surrogate monitoring data. As discussed in Appendix D.13.2.1 of the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate* (U.S. EPA, 2025t), these monitoring data are associated with three types of spray booths (downdraft, cross draft, or semi-downdraft) and two types of spray guns (conventional or high-volume low-pressure). The central tendency and high-end values of these monitoring data are not associated with any particular type of spray booth or spray gun.

With regard to the assessed high-end exposures from adhesive and sealant spray application, a confluence of a subset of variables (*e.g.*, low ventilation, *etc.*) would result in risk MOEs that are below the benchmark. While most workers are not expected to experience these conditions, they are considered plausible in the case of an acute 1-day exposure.

OES with Exposures Above Benchmark

DIBP has low volatility (*i.e.*, 4.76×10^{-5} mmHg), low rates of dermal absorption in humans (*i.e.*, 7.0×10^{-5} mg/cm²/hr), and low dust concentrations in occupational settings (*i.e.*, weight fractions ranging from 1.3×10^{-6} to 0.18). Consequently, the estimated levels of occupational exposure are relatively low for the majority of OES as evident from the MOE values reported in Table 4-16. Estimated occupational exposures (inhalation, dermal, and aggregate) are above the benchmark MOE of 30, and therefore not indicative of occupational risk, for the following OESs: Manufacturing; Import and repackaging; Incorporation into paints and coatings, Incorporation into adhesives and sealants; Formulation into pre-catalyst; Intermediate in polypropylene manufacturing; Plastics compounding; Plastics converting; Rubber compounding; Rubber converting; Application of paints and coatings (non-spray applications); Application of adhesives and sealants (non-spray applications); Use of laboratory chemicals (liquid and solid); Fabrication or use of final products and articles; Recycling; and Waste handling, treatment, and disposal. Exposures from the manufacture of polyurethane foam for pipeline pigs were not assessed directly, but levels of exposure are expected to be similar to plastic compounding, plastic converting, and rubber manufacturing exposures. Similarly, exposures from distribution in commerce were not assessed directly, but levels of exposure are expected to be similar to manufacturing and import/repackaging. Consequently, aggregate MOEs associated with the manufacture of polyurethane foam for pipeline pigs and distribution in commerce are expected to be above the benchmark MOE of 30. For the crosswalk between OESs and COUs, see Table 3-1 in Section 3.1.1.1.

4.3.2.1 Overall Confidence in Worker Risk Estimates for Individual DIBP COUs

As described in Section 4.1.1.4, in general EPA has moderate confidence in the inhalation exposure estimates for females of reproductive age and average adult workers and moderate confidence in dermal exposure estimates. The Agency has slight to moderate confidence in the assessed inhalation exposures

for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures in absence of ONU exposure data. As described in Section 4.2, EPA has robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP. Therefore, the Agency has moderate confidence overall in the risk estimates calculated for females of reproductive age and average adult workers inhalation and dermal exposure scenarios, except for high-end inhalation exposure in the paints and coatings OES, which has slight confidence. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs and slight to moderate confidence in the assessed ONU dermal exposures. Sources of uncertainty associated with these occupational COUs are discussed above in Section 4.1.1.4.

4.3.2.2 Consideration of Personal Protective Equipment (PPE)

The Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) both recommend employers utilize the hierarchy of controls⁶ to address hazardous exposures in the workplace. The hierarchy of controls strategy outlines, in descending order of priority, the use of elimination, substitution, engineering controls, administrative controls, and lastly PPE. The hierarchy of controls prioritizes the most effective measures, which eliminate or substitute the harmful chemical (*e.g.*, use a different process, substitute with a less hazardous material), thereby preventing or reducing exposure potential. Following elimination and substitution, the hierarchy recommends engineering controls to isolate employees from the hazard, followed by administrative controls or changes in work practices to reduce exposure potential (*e.g.*, source enclosure, local exhaust ventilation systems). Administrative controls are policies and procedures instituted and overseen by the employer to protect worker exposures. OSHA and NIOSH recommend the use of PPE (*e.g.*, respirators, gloves) as the last means of control, when the other control measures cannot reduce workplace exposure to an acceptable level.

4.3.2.2.1 Respiratory Protection

OSHA's Respiratory Protection Standard (29 CFR 1910.134) requires employers in certain industries to address workplace hazards by implementing engineering control measures and, if these are not feasible, providing respirators that are applicable and suitable for the purpose intended. Respirator selection provisions are provided in section 1910.134(d) and require that appropriate respirators be selected based on the respiratory hazard(s) to which the worker will be exposed, in addition to workplace and user factors that affect respirator performance and reliability. Assigned protection factors (APFs) are provided in Table 1 under section 1910.134(d)(3)(i)(A) (see below in Table 4-15) and refer to the level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a respiratory protection program according to the requirements of OSHA's Respiratory Protection Standard.

Workers are required to use respirators that meet or exceed the required level of protection listed in Table 4-15. Based on the APF, inhalation exposures may be reduced by a factor of 5 to 10,000, if respirators are properly worn and fitted.

⁶ https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf (accessed July 29, 2025).

Table 4-15. Assigned Protection Factors for Respirators in OSHA Standard 29 CFR 1910.134

Type of Respirator	Quarter Mask	Half Mask	Full Facepiece	Helmet/Hood	Loose-Fitting Facepiece
1. Air-purifying respirator	5	10	50	—	—
2. Power air-purifying respirator (PAPR)	—	50	1,000	25/1,000	25
3. Supplied-air respirator (SAR) or airline respirator					
• Demand mode	—	10	50	—	—
• Continuous flow mode	—	50	1,000	25/1,000	25
• Pressure-demand or other positive-pressure mode	—	50	1,000	—	—
4. Self-contained breathing apparatus (SCBA)					
• Demand mode	—	10	50	50	—
• Pressure-demand or other positive-pressure mode (<i>e.g.</i> , open/closed circuit)	—	—	10,000	10,000	—
Source: 29 CFR 1910.134(d)(3)(i)(A)					

4.3.2.3 Occupational Risk Estimates and Effect of PPE

Table 4-16 presents the acute duration risk estimates for female workers of reproductive age and the corresponding personal protection equipment (PPE) that would result in a worker MOE above the benchmark MOE. For occupational risk estimates, females of reproductive age are the most sensitive exposed population with the lowest worker MOEs. Furthermore, the acute exposure duration results in the lowest worker MOEs for this population. Risk estimates for other populations, durations, and health effects for all the COUs/OES are included in Table 4-17 and the *Draft Risk Calculator for Occupational Exposures for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025aa](#)). Additionally, the risk calculator contains MOE calculations and PPE information for all OESs.

Table 4-16 includes three main sections according to the route of exposure: inhalation, dermal, and aggregate exposure. Because dermal exposure does not significantly contribute to risk for any OES, protection factor (PF) values were not incorporated into the occupational risk summary table. For inhalation, typical respirator applied protection factor (APF) values of 10, 25, 50, 1,000, and 10,000 were compared to the calculated MOE and the benchmark MOE to determine the level of APF that could be used to bring MOEs above the benchmark MOE. Similarly for aggregate exposures, the APF that could be used to bring MOEs above the benchmark are also shown. Descriptions of the different APFs are included in the footnote of Table 4-16. The appropriateness of any protection factor that demonstrates exposures resulting in a worker MOE above the benchmark MOE may require additional consideration. The presented protection factors simply represent a value by which corresponding PPE may theoretically increase the estimated worker MOE above the benchmark MOE. The practicality and feasibility of implementing any PPE corresponding to a protection factor is part of a larger evaluation of effective occupational control strategies. Such an evaluation should take into consideration the hierarchy of hazard control options. The hierarchy of controls from most to least effective are elimination, substitution, engineering controls, administrative controls, and PPE.

Table 4-16 shows that using PPE for the two inhalation scenarios where the MOEs are below the benchmark MOE (*i.e.*, spray application of paints/coatings and spray application of adhesives/sealants),

2615 may decrease inhalation exposure levels such that the resulting MOE values are above the benchmark
2616 MOE of 30.

2617 **4.3.2.4 Occupational Risk Estimates for ONUs**

2618 ONUs may be exposed to dust, vapors or mists that enter their breathing zone while working in locations
2619 near where DIBP handling occurs. For inhalation exposure, in absence of data specific to ONU
2620 exposure, EPA assumes that worker central tendency exposure is representative of ONU exposure. Also,
2621 dermal exposure to ONUs were assessed for scenarios where there may be dust or mist generation since
2622 it is possible that in some situations an ONU may inadvertently contact a surface that has been
2623 contaminated by dust or mist containing DIBP. Dermal exposure to ONUs is represented by incidental
2624 skin contact equal to the surface area of one palm. EPA has slight to moderate confidence in inhalation
2625 and dermal in the assessed ONU exposures.

2626

Table 4-16. Occupational Risk Estimation for Acute Exposure for Females of Reproductive Age for DIBP

Occupational Exposure Scenario	Exposure Level	Inhalation			Dermal		Aggregate	
		Worker MOE No PPE ^a	Worker MOE with PPE ^b	APF ^{b c}	Worker MOE No PPE ^a	Worker MOE with PPE ^b	Worker MOE No PPE ^a	Worker MOE with PPE ^b
Manufacturing	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Import and repackaging	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Incorporation into adhesives and sealants	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Incorporation into paints and coatings	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Formulation into pre-catalyst	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Intermediate in polypropylene manufacturing	Central Tendency	10,319	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,255	N/A	N/A	828	N/A	606	N/A
Plastic compounding	Central Tendency	9,843	N/A	N/A	1,657	N/A	1,418	N/A
	High-End	1,966	N/A	N/A	828	N/A	583	N/A
Plastics converting	Central Tendency	1,966	N/A	N/A	1,657	N/A	899	N/A
	High-End	112	N/A	N/A	828	N/A	99	N/A
Rubber compounding	Central Tendency	413	N/A	N/A	1,657	N/A	330	N/A
	High-End	41	N/A	N/A	828	N/A	39	N/A
Rubber converting	Central Tendency	826	N/A	N/A	1,657	N/A	551	N/A
	High-End	43	N/A	N/A	828	N/A	41	N/A
Application of paints and coatings – spray application	Central Tendency	122	N/A	N/A	1,657	N/A	114	N/A
	High-End	1.9	47	APF 25	828	N/A	1.9	44

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Occupational Exposure Scenario	Exposure Level	Inhalation			Dermal		Aggregate	
		Worker MOE No PPE ^a	Worker MOE with PPE ^b	APF ^{b c}	Worker MOE No PPE ^a	Worker MOE with PPE ^b	Worker MOE No PPE ^a	Worker MOE with PPE ^b
Application of paints and coatings – non spray application	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Application of adhesives and sealants – spray application	Central Tendency	20	203	APF 10	1,657	N/A	20	181
	High-End	1.9	47	APF 25	828	N/A	1.9	44
Application of adhesives and sealants – non spray application	Central Tendency	10,321	N/A	N/A	1,657	N/A	1,427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Use of laboratory chemicals (liquids)	Central Tendency	10,321	N/A	N/A	1,657	N/A	1427	N/A
	High-End	2,256	N/A	N/A	828	N/A	606	N/A
Use of laboratory chemicals (solids)	Central Tendency	217,275	N/A	N/A	1,657	N/A	1,644	N/A
	High-End	15,290	N/A	N/A	828	N/A	786	N/A
Recycling	Central Tendency	794	N/A	N/A	1,657	N/A	537	N/A
	High-End	57	N/A	N/A	828	N/A	54	N/A
Waste handling, treatment, and disposal	Central Tendency	794	N/A	N/A	1,657	N/A	537	N/A
	High-End	57	N/A	N/A	828	N/A	54	N/A
Fabrication or use of final products and articles	Central Tendency	1,032	N/A	N/A	1,657	N/A	636	N/A
	High-End	115	N/A	N/A	828	N/A	101	N/A

PPE = personal protective equipment

^a Benchmark MOE = 30

^b APF = assigned protection factor

^c PPE with the least amount of APF that could be used to bring MOE values above the benchmark MOE are shown with corresponding MOE values

^d The *Draft Occupational Risk Calculator for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025y](#)) contains MOE calculations and PPE information for all OESs for all durations (acute, intermediate, and chronic).

2627 **Table 4-17. Occupational Risk Summary Table for DIBP**

Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	Average Adult Worker	Central Tendency	11,400	15,545	16,644	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644
Manufacturing – Importing	Importing	Repackaging into large and small containers	Average Adult Worker	Central Tendency	11,400	15,545	20,005	1,522	2,075	2,671	1,343	1,831	2,356
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	18,111	1,657	2,259	2,907	1,427	1,947	2,505
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
Processing – Repackaging	Repackaging (e.g., laboratory chemicals)		ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Average Adult Worker	Central Tendency	11,400	15,545	16,644	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Average Adult Worker	Central Tendency	11,400	15,545	16,644	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644

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Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (e.g., catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst	Average Adult Worker	Central Tendency	11,400	15,545	16,644	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing	Average Adult Worker	Central Tendency	11,398	15,543	16,641	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,491	3,397	3,637	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,319	14,071	15,066	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,255	3,075	3,292	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,398	15,543	16,066	3,044	4,151	4,444	2,402	3,276	3,508
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Average Adult Worker	Central Tendency	10,873	14,826	17,796	1,522	2,075	2,491	1,335	1,821	2,185
				High-End	2,171	2,961	3,170	761	1,038	1,111	564	768	823
	Females of Reproductive Age		Central Tendency	9,843	13,423	16,111	1,657	2,259	2,711	1,418	1,934	2,321	
			High-End	1,996	2,681	2,870	828	1,129	1,209	583	795	851	
			ONU	Central Tendency	10,873	14,826	15,874	3,044	4,151	4,982	2,378	3,243	3,893
	Processing aids, not otherwise listed												

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Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Processing – Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastics converting	Average Adult Worker	Central Tendency	2,171	2,961	3,619	1,522	2,075	2,537	895	1,220	1,491
				High-End	124	169	181	761	1,038	1,111	106	145	155
			Females of Reproductive Age	Central Tendency	1,966	2,681	3,276	1,657	2,259	2,761	899	1,226	1,498
				High-End	112	153	164	828	1,129	1,209	99	135	144
			ONU	Central Tendency	2,171	2,961	3,619	3,044	4,151	5,073	1,267	1,728	2,112
				High-End									
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber compounding	Average Adult Worker	Central Tendency	456	622	711	1,522	2,075	2,374	351	478	547
				High-End	45	61	65	761	1,038	1,111	42	58	62
			Females of Reproductive Age	Central Tendency	413	563	644	1,657	2,259	2,584	330	451	515
				High-End	41	55	59	828	1,129	1,209	39	53	56
			ONU	Central Tendency	456	622	711	3,044	4,151	4,748	397	541	619
				High-End									
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber converting	Average Adult Worker	Central Tendency	912	1,244	1,520	1,522	2,075	2,537	570	778	950
				High-End	48	65	69	761	1,038	1,111	45	61	65
			Females of Reproductive Age	Central Tendency	826	1,126	1,376	1,657	2,259	2,761	551	751	918
				High-End	43	59	63	828	1,129	1,209	41	56	60
			ONU	Central Tendency	912	1,244	1,520	3,044	4,151	5,073	702	957	1,170
				High-End									
Industrial use – Paints and coatings	Paints and coatings	Application of paints and coatings (spray application)	Average Adult Worker	Central Tendency	135	184	197	1,522	2,075	2,222	124	169	181
				High-End	2.1	2.8	3.0	761	1,038	1,111	2.1	2.8	3.0
			Females of Reproductive Age	Central Tendency	122	167	178	1,657	2,259	2,419	114	155	166
				High-End	1.9	2.5	2.7	828	1,129	1,209	1.9	2.5	2.7
Commercial Use – Paints and coatings	Paints and coatings		ONU	Central Tendency	135	184	197	3,044	4,151	4,444	129	176	189

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Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	16,644	1,522	2,075	2,222	1,343	1,831	1,960
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	1,657	2,259	2,419	1,427	1,947	2,084
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
Commercial Use – Paints and coatings	Paints and coatings		ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	11,400	15,545	16,644
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (spray application)	Average Adult Worker	Central Tendency	22	31	35	1,522	2,075	2,395	22	30	35
				High-End	2.1	2.8	3.0	761	1,038	1,111	2.1	2.8	3.0
			Females of Reproductive Age	Central Tendency	20	28	32	1,657	2,259	2,606	20	27	32
				High-End	1.9	2.5	2.7	828	1,129	1,209	1.9	2.5	2.7
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives		ONU	Central Tendency	22	31	35	3,044	4,151	4,789	22	30	35
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	17,935	1,522	2,075	2,395	1,343	1,831	2,113
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,267	1,657	2,259	2,606	1,427	1,947	2,246
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives		ONU	Central Tendency	11,400	15,545	17,935	N/A	N/A	N/A	11,400	15,545	17,935

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Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (liquids)	Average Adult Worker	Central Tendency	11,400	15,545	17,706	1,522	2,075	2,364	1,343	1,831	2,086
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,030	1,657	2,259	2,573	1,427	1,947	2,217
				High-End	2,256	3,076	3,294	828	1,129	1,209	606	826	885
			ONU	Central Tendency	11,400	15,545	17,706	N/A	N/A	N/A	11,400	15,545	17,706
				High-End	2,492	3,398	3,638	761	1,038	1,111	583	795	851
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Average Adult Worker	Central Tendency	240,000	327,27	372,766	1,522	2,075	2,364	1,512	2,062	2,349
				High-End	16,889	23,030	24,658	761	1,038	1,111	728	993	1,063
			Females of Reproductive Age	Central Tendency	217,275	296,284	337,470	1,657	2,259	2,573	1,644	2,242	2,554
				High-End	15,290	20,850	22,323	828	1,129	1,209	786	1,071	1,147
			ONU	Central Tendency	240,000	327,273	372,766	3,044	4,151	4,728	3,006	4,099	4,669
				High-End	16,889	23,030	24,658	761	1,038	1,111	728	993	1,063
Processing – Recycling	Recycling	Recycling	Average Adult Worker	Central Tendency	877	1,196	1,435	1,522	2,075	2,491	556	759	911
				High-End	63	87	93	761	1,038	1,111	59	80	86
			Females of Reproductive Age	Central Tendency	794	1,083	1,299	1,657	2,259	2,711	537	732	878
				High-End	57	78	84	828	1,129	1,209	54	73	78
			ONU	Central Tendency	877	1,196	1,435	3,044	4,151	4,982	681	928	1,114
				High-End	63	87	93	761	1,038	1,111	59	80	86
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Average Adult Worker	Central Tendency	877	1,196	1,435	1,522	2,075	2,491	556	759	911
				High-End	63	87	93	761	1,038	1,111	59	80	86
			Females of Reproductive Age	Central Tendency	794	1,083	1,299	1,657	2,259	2,711	537	732	878
				High-End	57	78	84	828	1,129	1,209	54	73	78
			ONU	Central Tendency	877	1,196	1,435	3,044	4,151	4,982	681	928	1,114
				High-End	63	87	93	761	1,038	1,111	59	80	86

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Life Cycle Stage – Category	Subcategory	OES ^a	Population	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)			Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)		
					Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Average Adult Worker	Central Tendency	1,140	1,555	1,664	1,522	2,075	2,222	652	889	952
				High-End	127	173	185	761	1,038	1,111	109	148	159
Females of Reproductive Age	Central Tendency		1,032	1,407	1,507	1,657	2,259	2,419	636	867	928		
	High-End		115	156	167	828	1,129	1,209	101	137	147		
Commercial Use – Toys, playground, and sporting equipment	Toys, playground, and sporting equipment		ONU	Central Tendency	1,140	1,555	1,664	3,044	4,151	4,444	829	1,131	1,211

^a EPA assessed worker and ONU inhalation exposures in the case of the Manufacture of polyurethane foam for pipeline pigs OES qualitatively and therefore numerical estimates are not included in this table. The Agency assessed this OES qualitatively by determining that the daily rate of the release of DIBP from each of the various sources of release of this OES is less than the daily rate of the release of DIBP from a corresponding source of release of the Plastics compounding OES, Plastics converting OES, or Rubber manufacturing OES.

^b In absence of ONU inhalation exposure data, EPA used worker central tendency exposure estimates as surrogate data for ONU inhalation exposure. Dermal exposures to ONUs are represented by incidental skin contact equal to the surface area of 1 palm.

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4.3.3 Risk Estimates for Consumers

Table 4-18 summarizes the dermal, inhalation, ingestion, and aggregate MOEs used to characterize non-cancer risk for acute, intermediate, and chronic exposure to DIBP, and presents these values for all lifestages for each COU. A screening level assessment for consumers considers high-intensity exposure scenario risk estimates and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. Using the high-intensity risk estimates will assist in providing health protective approaches. MOEs for high-intensity exposure scenarios are shown for all consumer COUs, while MOEs for medium-intensity exposure scenarios are shown only for COUs with high-intensity MOEs at or below the benchmark of 30.

Further, Table 4-18 provides MOEs for the modeling indoor exposure assessment. The main objective in reconstructing the indoor environment using consumer products and articles commonly present in indoor spaces is to calculate exposure and risk estimates by COU, and by product and article from indoor dust ingestion and inhalation. EPA identified article-specific information by COU to construct relevant and representative exposure scenarios. Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area ($>1 \text{ m}^2$) for either a single article or collection of like articles as appropriate. Articles included in the indoor environment assessment included: children's toys (new and legacy), furniture components (textiles), vinyl flooring, carpet tiles, air beds, car mats, in-place wallpaper, shower curtains, and tire crumb. COUs associated with articles included in the indoor environment assessment are indicated with footnotes in Table 4-18.

Of note, the risk summary below is based on the most sensitive, non-cancer endpoint for all relevant duration scenarios (*i.e.*, reduced fetal testicular testosterone production for acute, intermediate, and chronic durations). MOEs for all high-, medium- and low-intensity exposure scenarios for all COUs are described in the *Draft Consumer Risk Calculator for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025g](#)).

COUs with MOEs for High-Intensity Use Exposure Scenarios Above Benchmark

The screening level assessment for consumers considers high-intensity exposure scenario risk estimates, MOEs, and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. If MOEs are above the benchmark of 30 for the high intensity use scenario then any exposures with lower intensity use inputs would result in larger MOEs. Consumer COUs that resulted in MOEs for high-intensity exposure scenarios above the benchmark of 30 for acute, chronic and intermediate exposures are summarized in Table 4-18 and in the following list:

- Adhesives and sealants;
- Fabric, textile, and leather products not covered elsewhere; fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes);
- Paints and coatings;
- Plastic and rubber products not covered elsewhere; and
- Toys, playground, and sporting equipment.

Variability in MOEs for these high-intensity exposure scenarios results from use of different exposure factors for each COU and product/article examples that led to different estimates of exposure to DIBP. As described in the *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025g](#)) and *Draft Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025w](#)), EPA has moderate to robust confidence in the exposure estimates and robust confidence in the non-cancer hazard value used to estimate non-cancer risk for these COUs.

COUs with MOEs for High-Intensity Use Exposure Scenarios Below Benchmark

The screening level assessment for consumers considers high-intensity exposure scenario risk estimates, MOEs, and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. If MOEs are below the benchmark of 30 for the high intensity use scenario, EPA reevaluates the approaches and inputs used and determines if refinement of those is needed. In addition, EPA considers the medium intensity use scenario as either a new possible upper bound estimate by reevaluating inputs and approaches or endeavors in the refinement of approaches by using other modeling tools or other input parameters within the same modeling tools. See Section 2 in *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025g](#)) for details about the consumer modeling approaches, sources of data, model parameterization, and assumptions. Consumer COUs that resulted in MOEs for high-intensity exposure scenarios below the benchmark of 30 for acute, chronic and intermediate exposures are summarized in Table 4-18.

The consumer COUs that resulted in MOEs below the benchmark of 30 are discussed in further detail in the subsection below. The subsection expands on the COU and the aspects driving the MOEs below the benchmark.

Floor Coverings

This section summarizes the risk estimates, MOEs, below the benchmark of 30 for the titled COU. Two different scenarios were assessed under this COU for articles with differing use patterns. The scenarios of vinyl flooring and carpet tiles were evaluated. Both scenarios were part of the indoor assessment and evaluated for all exposure routes except mouthing. Of the two article scenarios assessed for this COU, the acute and chronic inhalation exposure from vinyl flooring resulted in MOEs less than 30 for infants and toddlers for acute and infants for chronic. The acute inhalation, high-intensity exposure scenario MOEs for vinyl flooring were 24 and 25 for infants and toddlers, and the medium-intensity use scenario MOEs were 140 and 120 for infants and toddlers. The chronic inhalation, high-intensity use MOEs for vinyl flooring for infants was 29 and the medium-intensity use scenario MOE for infants was 170.

Vinyl flooring was assessed for DIBP exposure by inhalation, dust ingestion, and dermal exposure routes, but only inhalation resulted in MOEs below 30. In an ECHA proposal for restriction report, DIBP was reported in three vinyl flooring materials at 0.0065, 0.0159, and 0.0571 w/w ([Danish EPA, 2011](#)). In a Danish EPA study, DIBP was found in three vinyl flooring materials at weight fractions of 5.6×10^{-5} , 8.13×10^{-4} , and 0.074 w/w ([Danish EPA, 2010](#)). EPA used both references weight fraction values for the low-, medium-, and high-intensity exposure scenarios for vinyl flooring were the minimum and maximum values correspond to the low- and high-intensity use scenarios, 5.6×10^{-5} and 0.074 w/w, respectively. The average of all data points, 0.026 w/w, was used for the medium-intensity use scenario.

Key input parameters that control DIBP emission rates (modeled within CEM as part of each scenario simulation) from vinyl flooring in CEM are DIBP physical and chemical properties, weight fraction of DIBP in the material, density of vinyl flooring (g/cm^3), article surface area (m^2), and surface layer thickness (cm). An increase in any of these input parameters results in increased emissions and greater exposure to DIBP. DIBP emissions from vinyl flooring are estimated based on a first order source decay methodology. In inhalation scenarios where DIBP is released from an article, vinyl flooring, into the gas-phase, the article inhalation scenario tracks chemical transport between the source, air, airborne and settled particles, and indoor sinks. The model tracks transport by accounting for emissions, mixing within the gas phase, transfer to particulates by partitioning, removal due to ventilation, removal due to

cleaning of settled particulates and dust to which DIBP has partitioned, and sorption or desorption to/from interior surfaces.

Material density was assumed to be a standard value for PVC of 1.4 g/cm³ in all articles. Values for article surface layer thickness were taken from CEM default values for scenarios with emissions from the same or similar solid material. CEM default values for parameters used to characterize the environment (use volume, air exchange rate, and interzonal ventilation rate) were used for all modeled articles, including vinyl flooring. To estimate surface areas for vinyl flooring, it was assumed that the material was used in 100, 50, and 25 percent of the total floor space. The floor space input value was calculated from the CEM whole house volume (492 m³) and an assumed ceiling height of 8 ft. The resulting values were used in the high-, medium-, and low-intensity use exposure scenarios, 202, 101, and 50.5 m², respectively. EPA has robust confidence that the use of 100 and 50 percent inputs for the total floor space captures actual uses.

For exposure durations, EPA used the stay-at-home activity pattern for this assessment for all scenarios as the most conservative behavior pattern for a screening approach analysis. For the stay-at-home activity pattern used in the vinyl flooring assessment, exposed people are assumed to be in the home the majority of the day (20 hours). CEM default air exchange rates for the building are from the Exposure Factors Handbook (U.S. EPA, 2011a). The default interzonal air flows are a function of the overall air exchange and volume of the building as well as the openness of the room, which is characterized in a regression approach for closed rooms and open rooms (U.S. EPA, 2023b). For vinyl flooring the whole house modeling option was selected, the entire building is considered zone 1, and the interzonal ventilation rate is therefore equal to the negligible value of 1×10^{-30} m³/hour. EPA has robust confidence in the selected inputs for inhalation exposures from vinyl flooring.

The emissions from vinyl flooring were modeled with a single exponential decay model. This means that the chronic and acute exposure duration scenarios use the same emissions/air concentration data based on the weight fraction of the chemical in the article but have different averaging times. The acute data uses the peak concentration from the simulated 24-hour period, while the chronic uses that same peak concentration data averaged over the entire one-year period. Because air concentrations for most of the year are significantly lower than the peak value, the air concentration used in chronic dose calculations are usually lower than that used to calculate an acute dose. For detailed descriptions of CEM modeling see Emission from Article Placed in Environment in (U.S. EPA, 2023b) and supporting study Little et al. (1994) and ASTM D5116-25. Duration, frequency and surface area of the article have been determined to be key determinants of estimated exposure concentrations according to a sensitivity analysis conducted for CEM input parameters in Appendix C in U.S. EPA (2023b). The overall confidence in this COU inhalation exposure estimate is robust because the CEM input parameters are representative, and the associated uncertainties are well understood.

The inhalation from vinyl flooring high-intensity use exposure scenario resulted in MOEs below 30 for infants and toddlers for acute and infants for chronic durations. This scenario represents infants and toddlers that spend most of their time at home and the entirety of their house flooring contains DIBP. The surface area coverage of vinyl flooring is a sensitive input with significant impact on exposure and risk estimates (U.S. EPA, 2023b). As such, EPA modeled high-, medium-, and low-intensity use exposure scenarios that considers large (100%) to low (25%) surface coverage, and the identified range of vinyl flooring weight fractions (5.6×10^{-5} to 0.074 w/w). Although the high-intensity use exposure scenario is possible it may be an upper-bound estimate and EPA is uncertain and lacks supporting evidence of the widespread use of vinyl flooring coverage in homes. As such, EPA recommends the consideration of the acute and chronic vinyl flooring inhalation medium-intensity use exposure

scenarios, which considers a smaller vinyl flooring coverage in homes, 50 percent and a 0.026 w/w DIBP content. The medium- and low-intensity use scenarios allow for the presence of other floor coverings in addition to vinyl flooring, which may be a better representation of average U.S. homes.

Aggregate risk estimates across all evaluated exposure routes, dermal, ingestion, and inhalation exposures to DIBP for vinyl flooring was also considered. The acute, high-intensity use aggregate exposure scenario MOE for toddlers to preschoolers was below the benchmark of 30 and chronic, high-intensity use aggregate for infants and toddlers. The inhalation MOE was the primary contributor to the aggregated MOE value under 30, while ingestion exposures have a relatively lower contribution, but enough to position aggregated results below the benchmark for preschoolers, which were not under the benchmark when considering individual exposure routes for acute exposures and for toddlers when considering individual exposure routes for chronic exposures. See the Aggregate Tab in U.S. EPA (2025g) for the MOE values per exposure route and aggregated results.

Indoor Dust

Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area (exceeding $\sim 1 \text{ m}^2$) for either a single article or collection of like articles as appropriate, including furniture components textiles, carpet tiles, vinyl flooring, air beds, car mats, shower curtains, in-place wallpaper, children's toys, both legacy and new, and tire crumb. In a screening assessment for indoor dust ingestion, EPA considered the aggregation of chronic dust ingestion doses (Section 4.1.2.3). However, the indoor assessment was further refined to only consider articles assumed to be present in residential indoor environments because the use of the stay-at-home CEM inputs would result in greater exposures than other non-residential environment options. Articles considered in this indoor assessment include furniture components textiles, carpet tiles, vinyl flooring, in-place wallpaper, shower curtains, and children's toys new and legacy. Car mats, air beds, and tire crumb were considered not to be continuously available in residential indoor environments, as car mats are present in vehicles, air beds tend to be stored away, and tire crumb is present in gyms and outdoor recreational areas. The highest refined aggregated dose from indoor scenario chronic ingestion of settled dust was for preschoolers aged 3 to 5 years and resulted in an MOE of 230. See *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025d). All other doses were lower and would have resulted in larger MOEs.

4.3.3.1 Overall Confidence in Consumer Risk Estimates for Individual DIBP COUs

As described in Section 4.1.2.4 and in more details in the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025d), EPA has moderate and robust confidence in the assessed inhalation, ingestion, and dermal consumer exposure scenarios, and robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP (see Section 4.2 and (U.S. EPA, 2025w)). The exposure doses used to estimate risk relied on conservative, health protective inputs and parameters that are considered representative of a wide selection of use patterns. Overall, EPA has moderate or robust confidence in the risk estimates calculated for consumers inhalation, ingestion, and dermal exposure scenarios. The overall confidence considers confidence in the approach and the inputs used in the calculations. Sources of uncertainty associated with the three consumer COUs with MOEs less than 30 are discussed above in Section 4.3.3.

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Table 4-18. Consumer Risk Summary Table

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Construction, paint, electrical, and metal products: Adhesives and sealants, including fillers and putties	Concrete adhesive	Acute ^c	Dermal	H	–	–	–	–	32,000	35,000	33,000
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	Dermal	H	–	–	–	–	2,800	3,000	2,800
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Chronic	–	–	–	–	–	–	–	–	–
	Wood flooring adhesive	Acute ^c	Dermal	H	–	–	–	–	8,000	8,800	8,200
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	43 ^b	45 ^b	56 ^b	71 ^b	95	120	140
			Aggregate	H	–	–	–	–	93	120	140
		Intermediate	Dermal	H	–	–	–	–	690	760	710
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	1,300 ^b	1,400 ^b	1,700 ^b	2,100 ^b	2,800	3,600	4,200
			Aggregate	H	–	–	–	–	560	630	610
		Chronic	–	–	–	–	–	–	–	–	–
	Sealants for small home repairs	Acute ^c	Dermal	H	–	–	–	–	6,400	7,000	6,600
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	64 ^b	68 ^b	84 ^b	120 ^b	130	160	190
			Aggregate	H	–	–	–	–	130	150	180
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	–	–	45,000	49,000	46,000
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	120 ^b	130 ^b	160 ^b	230 ^b	250	300	360
			Aggregate	H	–	–	–	–	250	300	360

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Clothing (children's)	Acute ^c	Dermal	H	40	45	50	60	73	–	–
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	40	45	50	60	73	–	–
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Clothing (synthetic leather)	Acute ^c	Dermal	H	–	–	–	–	– ^e	– ^e	– ^e
				M	–	–	–	–	1,200	1,400	1,300
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	– ^e	– ^e	– ^e
		Chronic	Dermal	H	–	–	–	–	8,700	9,600	9,100
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Furniture components (textile)	Acute ^c	Dermal	H	– ^e	– ^e	– ^e	– ^e	73	79	83
				M	– ^e	580	740	970	1,200	1,400	1,300
			Ingestion ^d	H	6.50E03	7.50E03	7.90E03	3.00E04	5.30E04	6.70E04	1.50E05
			Inhalation ^d	H	680	720	880	1.30E03	1.80E03	2.10E03	2.60E03
			Aggregate	H	610	660	790	1,200	70	76	80
				M	9,400	550	700	920	1,200	1,300	1,300
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	– ^e	– ^e	– ^e	– ^e	73	79	83
				M	– ^e	580	740	970	1,200	1,400	1,300
			Ingestion ^d	H	7.10E03	8.40E03	9.00E03	3.60E04	6.40E04	8.10E04	1.80E05
			Inhalation ^d	H	840	890	1.10E03	1.60E03	2.20E03	2.60E03	3.20E03
			Aggregate	H	750	810	980	1,500	70	77	81
				M	11,000	550	710	930	1,200	1,300	1,300

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)								
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)		
	Small articles with potential for semi–routine contact: bags, belts, headband accessories, and steering wheel cover	Acute ^c	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300		
			Ingestion	–	–	–	–	–	–	–	–		
			Inhalation	–	–	–	–	–	–	–	–		
		Intermediate	–	–	–	–	–	–	–	–	–		
			Chronic	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300	
				Ingestion	–	–	–	–	–	–	–	–	
				Inhalation	–	–	–	–	–	–	–	–	
Consumer Uses: Floor coverings	Carpet tiles	Acute ^c	Dermal	H	3,000	3,500	4,100	5,100	6,400	7,000	6,600		
			Ingestion ^d	H	1.80E06	1.50E06	1.30E06	3.80E06	6.70E06	8.50E06	1.90E07		
			Inhalation ^d	H	1.60E05	1.70E05	2.10E05	3.00E05	4.20E05	4.90E05	6.10E05		
			Aggregate	H	3,000	3,500	4,100	5,100	6,400	7,000	6,600		
		Intermediate	–	–	–	–	–	–	–	–	–		
		Chronic	Dermal	H	3,000	3,500	4,100	5,100	6,400	7,000	6,600		
			Ingestion ^d	H	2.20E06	1.80E06	1.60E06	4.50E06	8.10E06	1.00E07	2.30E07		
			Inhalation ^d	H	2.00E05	2.10E05	2.60E05	3.70E05	5.20E05	6.10E05	7.60E05		
			Aggregate	H	3,000	3,500	4,100	5,100	6,400	7,000	6,600		
		Consumer Uses: Floor coverings	Vinyl flooring	Acute ^c	Dermal	H	6,100	7,100	8,200	10,000	13,000	14,000	13,000
					Ingestion ^d	H	280	220	200	560	1.00E03	1.30E03	2.80E03
Inhalation ^d	M				140	140	180	250	360	420	530		
	H				24	25	31	44	63	74	92		
Aggregate	M				120	130	150	230	340	390	500		
	H				22	23	27	41	59	69	88		
Intermediate	–			–	–	–	–	–	–	–	–		
Chronic	Dermal			H	6,100	7,100	8,200	10,000	13,000	14,000	13,000		
	Ingestion ^d			H	330	270	240	680	1.20E03	1.50E03	3.40E03		
	Inhalation ^d			M	170	180	220	320	450	520	650		
				H	29	31	38	55	78	91	110		
	Aggregate	M	150	160	190	290	410	490	620				
H	27	28	33	51	73	86	110						

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)							
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)	
Consumer Uses: Paints and coatings	Paints	Acute ^c	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300	
			Ingestion	H	–	–	–	–	–	–	–	
			Inhalation	H	–	–	–	–	–	–	–	
		Intermediate	–	–	–	–	–	–	–	–		
		Chronic	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300	
			Ingestion	H	–	–	–	–	–	–	–	
			Inhalation	H	–	–	–	–	–	–	–	
Consumer Uses: Plastic and rubber products not covered elsewhere	Air beds	Acute ^c	Dermal	H	–	–	210	270	350	380	360	
			Ingestion ^d	H	5.30E07	4.20E07	3.80E07	1.10E08	1.90E08	2.40E08	5.40E08	
			Inhalation ^d	H	2.20E06	2.30E06	2.90E06	4.10E06	5.90E06	6.80E06	8.50E06	
			Aggregate	H	2.10E06	2.20E06	210	270	350	380	360	
		Intermediate	–	–								
		Chronic	Dermal	H	–	–	2,100	2,700	3,500	3,900	3,700	
			Ingestion ^d	H	6.30E07	5.10E07	4.50E07	1.30E08	2.30E08	2.90E08	6.50E08	
			Inhalation ^d	H	2.70E06	2.90E06	3.60E06	5.10E06	7.20E06	8.50E06	1.10E07	
			Aggregate	H	2.60E06	2.70E06	2,100	2,700	3,500	3,900	3,700	
		Car mats	Acute ^c	Dermal	H	–	–	–	–	6.4E04	7.0E04	6.6E04
				Ingestion ^d	H	2.00E08	1.60E08	1.50E08	4.00E08	7.00E08	8.70E08	1.80E09
				Inhalation ^d	H	7.70E06	8.20E06	1.00E07	1.40E07	2.10E07	2.40E07	3.00E07
	Aggregate			H	7.40E06	7.80E06	9.40E06	1.40E07	6.4E04	7.0E04	6.6E04	
	Intermediate		–	–	–	–	–	–	–	–		
	Chronic		Dermal	H	–	–	–	–	450,000	490,000	460,000	
			Ingestion ^d	H	2.40E08	2.00E08	1.80E08	4.80E08	8.50E08	1.10E09	2.20E09	
			Inhalation ^d	H	1.00E07	1.10E07	1.30E07	1.90E07	2.70E07	3.10E07	3.90E07	
			Aggregate	H	9.60E06	1.00E07	1.20E07	1.80E07	4.4E05	4.9E05	4.6E05	
	Footwear components		Acute ^c	Dermal	H	3,800	4,400	5,100	6,300	8,000	8,800	8,200
				Ingestion	H	–	–	–	–	–	–	–
				Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–		

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Plastic and rubber products not covered elsewhere											
		Chronic	Dermal	H	3,800	4,400	5,100	6,300	8,000	8,800	8,200
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Shower curtains	Acute ^c	Dermal	H	12,000	14,000	16,000	20,000	26,000	28,000	26,000
			Ingestion ^d	H	4.60E06	3,700,000	3.30E06	9.40E06	1.70E07	2.10E07	4.70E07
			Inhalation ^d	H	1.40E05	1.50E05	1.80E05	2.70E05	3.80E05	4.40E05	5.50E05
			Aggregate	H	1.70E03	2.00E03	2.40E03	2.90E03	3.70E03	4.10E03	3.80E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	12,000	14,000	16,000	20,000	26,000	28,000	26,000
			Ingestion ^d	H	5.50E06	4.50E06	4.00E06	1.10E07	2.00E07	2.50E07	5.70E07
			Inhalation ^d	H	1.70E05	1.90E05	2.30E05	3.30E05	4.70E05	5.40E05	6.80E05
			Aggregate	H	1.70E03	2.00E03	2.40E03	2.90E03	3.70E03	4.10E03	3.80E03
		Acute ^c	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–							
		Chronic	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Tire crumb	Acute ^c	Dermal	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
			Ingestion	H	–	–	9.80E05	2.20E06	4.00E06	1.00E07	1.10E07
			Inhalation	H	–	–	9.10E05	1.40E06	7.00E05	1.30E06	1.40E06
			Aggregate	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	1.60E04	1.70E04	1.20E04	1.40E04	2.30E04

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Plastic and rubber products not covered elsewhere			Ingestion	H	–	–	4.60E06	1.00E07	1.10E07	2.70E07	5.30E07
			Inhalation	H	–	–	4.30E06	6.40E06	1.80E06	3.50E06	6.70E06
			Aggregate	H	–	–	1.50E04	1.60E04	1.20E04	1.40E04	2.30E04
	Wallpaper (in place)	Acute ^c	Dermal	H	12,000	14,000	16,000	20,000	26,000	28,000	–
			Ingestion ^d	H	3.30E04	2.60E04	2.30E04	6.70E04	1.20E05	1.50E05	3.40E05
			Inhalation ^d	H	2.80E03	3.00E03	3.70E03	5.30E03	7.50E03	8.70E03	1.10E04
			Aggregate	H	2,100	2,300	2,700	3,900	5,500	6,400	1.10E04
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	12,000	14,000	16,000	20,000	26,000	28,000	–
			Ingestion ^d	H	3.90E04	3.20E04	2.80E04	8.00E04	1.40E05	1.80E05	4.00E05
			Inhalation ^d	H	3.50E03	3.70E03	4.60E03	6.60E03	9.30E03	1.10E04	1.40E04
			Aggregate	H	2,500	2,700	3,200	4,700	6,500	7,500	1.30E04
	Wallpaper (installation)	Acute ^c	Dermal	H	–	–	–	–	1,600	1,800	1,600
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	–	–	–	–	–	–	–	–	–
Consumer Uses: Toys, playground, and sporting equipment	Children’s toys (legacy)	Acute ^c	Dermal	H	2,600	3,100	3,600	4,400	5,600	6,200	–
			Ingestion ^d	H	6.30E03	1.60E04	2.00E04	9.00E04	1.60E05	2.00E05	4.50E05
			Inhalation ^d	H	1.80E03	2.00E03	2.40E03	3.50E03	4.90E03	5.70E03	7.10E03
			Aggregate	H	930	1,100	1,300	1,900	2,600	2,900	7,000
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	2,600	3,100	3,600	4,400	5,600	6,200	–
			Ingestion ^d	H	6.50E03	1.70E04	2.30E04	1.10E05	1.90E05	2.40E05	5.40E05
			Inhalation ^d	H	2.30E03	2.40E03	3.00E03	4.30E03	6.10E03	7.10E03	8.80E03
			Aggregate	H	1,000	1,300	1,500	2,100	2,900	3,300	8.70E03
	Children’s toys (new)	Acute ^c	Dermal	H	2,600	3,100	3,600	4,400	5,600	6,200	–
			Ingestion ^d	H	7.30E03	2.60E04	4.70E04	9.00E05	1.60E06	2.00E06	4.50E06
			Inhalation ^d	H	1.80E04	2.00E04	2.40E04	3.50E04	4.90E04	5.70E04	7.10E04

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Toys, playground, and sporting equipment			Aggregate	H	1,800	2,400	2,900	3,900	5,000	5,500	7.00E04
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	2,600	3,100	3,600	4,400	5,600	6,200	–
			Ingestion ^d	H	7.30E03	2.60E04	4.80E04	1.10E06	1.90E06	2.40E06	5.40E06
			Inhalation ^d	H	2.30E04	2.40E04	3.00E04	4.30E04	6.10E04	7.10E04	8.80E04
			Aggregate	H	1,800	2,500	3,000	4,000	5,100	5,600	8.70E04
	Small articles with potential for semi-routine contact: variety pvc articles, diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	Acute ^c	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	1,500	1,800	2,000	2,500	3,200	3,500	3,300
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Acute ^c	Dermal	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
			Ingestion	H	–	–	9.80E05	2.20E06	4.00E06	1.00E07	1.10E07
			Inhalation	H	–	–	9.10E05	1.40E06	7.00E05	1.30E06	1.40E06
			Aggregate	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
	Tire crumb	Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	1.60E04	1.70E04	1.20E04	1.40E04	2.30E04
			Ingestion	H	–	–	4.60E06	1.00E07	1.10E07	2.70E07	5.30E07
			Inhalation	H	–	–	4.30E06	6.40E06	1.80E06	3.50E06	6.70E06
			Aggregate	H	–	–	1.50E04	1.60E04	1.20E04	1.40E04	2.30E04

^a Exposure scenario intensities include high (H), medium (M), and low (L), see *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)) for description of exposure scenario intensities and modeling inputs selection. A screening level assessment for consumers considers high-intensity exposure scenario risk estimates and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. MOEs for high-intensity exposure scenarios are shown for all consumer COUs, while MOEs for medium- and low-intensity exposure scenarios are shown only for COUs with high- and low-intensity MOEs at or below the benchmark of 30.

^b MOE for bystander scenario

^c Scaling by the RPF and application of the index chemical POD provides a more sensitive and robust hazard assessment than the DIBP-specific POD, given its more limited toxicological dataset. Please see Table 4-23 for the RPF analysis values.

^d Exposure routes evaluated for indoor environments.

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Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L) ^a	Lifestage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
^e Scenario was deemed to be unlikely; see <i>Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025d).											

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4.3.4 Risk Estimates for General Population Exposed to DIBP through Environmental Releases

EPA utilized previously peer reviewed methodologies to conduct screening level analyses of general population exposure to DIBP associated with TSCA COUs via the ambient air, ambient water, ambient land, and fish ingestion pathways/routes as described in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)) and Section 4.1.3. This assessment focuses on subsets of the general population in proximity to releasing facilities, including fenceline communities.

EPA evaluated surface water, drinking water, fish ingestion, ambient air, and soil via deposition from ambient air pathways quantitatively. Land pathways (*i.e.*, landfills and application of biosolids) were assessed qualitatively, and were inclusive of down-the-drain disposal of consumer products and landfill disposal of consumer articles (see Section 3.1.3 for details on the qualitative assessment of consumer disposal of DIBP-containing products and articles). For pathways assessed quantitatively, EPA used high-end estimates of DIBP concentration in the various environmental media for screening level purposes. EPA used a MOE approach using high-end exposure estimates with the human health POD to determine whether an exposure pathway had potential non-cancer risks. High-end exposure estimates were defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations. If there is no risk for an individual identified as having the potential for the highest exposure for a COU and given pathway of exposure, then EPA determined that the pathway was not a pathway of concern and the pathway was not further evaluated. If any pathways were identified as a pathway of concern for the general population, further exposure assessments for that pathway would be conducted to include higher tiers of modeling, if available, additional subpopulations and COUs. Risk estimates for the screening analysis for the various pathways assessed quantitatively are described in Section 4.1.3. No estimated MOEs were below the benchmark MOE of 30, even under very conservative exposure scenarios. Therefore, using a screening level approach described in Section 4.1.3, exposure to DIBP through biosolids, landfills, surface water, drinking water, fish ingestion, ambient air, and soil via deposition from ambient air, were not determined to be pathways of concern for any COU listed in Table 3-1.

4.3.4.1 Overall Confidence in General Population Risk

As described in Sections 3.3.1.1 and 4.1.3.3 and in more technical detail in the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)), EPA has robust confidence that modeled releases used for the screening level analysis are appropriately conservative for a screening level analysis. Therefore, EPA has robust confidence that no exposure scenarios will lead to greater exposures than presented in this evaluation. Despite moderate confidence in the estimated values themselves, confidence in exposure estimates capturing high-end exposure scenarios was robust given the conservative assumptions used for the estimates. Along with EPA's robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP (see Section 4.2 and ([U.S. EPA, 2025w](#))), EPA has robust confidence that the risk estimates calculated for the general population were conservative and appropriate for a screening level analysis.

4.3.5 Risk Estimates for Potentially Exposed or Susceptible Subpopulations

EPA considered PESS throughout the exposure assessment and throughout the hazard identification and dose-response analysis supporting the draft DIBP risk evaluation.

Some population group lifestages may be more susceptible to the health effects of DIBP exposure. As discussed in Section 4.2 and in EPA's *Draft Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025w](#)) and *Draft Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* ([U.S. EPA, 2024h](#)), exposure to DIBP causes adverse effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome in experimental animal models. Therefore, females of reproductive age, pregnant women, male infants, male children, and male adolescents are considered to be susceptible subpopulations. These susceptible lifestages were considered throughout the draft risk evaluation. For example, females of reproductive age were evaluated for occupational exposures to DIBP for each COU (Section 4.3.2). Additionally, infants (<1 year), toddlers (1–2 years), preschoolers (3–5 years), middle school children (6–10 years), young teens (11–15 years), and teenagers (16–20 years) were evaluated for exposure to DIBP through consumer products and articles (Section 4.3.3). EPA also considered cumulative phthalate exposure and risk for female workers of reproductive age, as well as male children and female consumers of reproductive age. Additionally, the Agency used a value of 10 for the UF_H to account for human variability. The Risk Assessment Forum, in *A Review of the Reference Dose and Reference Concentration Processes*, discusses some of the evidence for choosing the default factor of 10 when data are lacking—including toxicokinetic and toxicodynamic factors as well as greater susceptibility of children and elderly populations ([U.S. EPA, 2002b](#)).

The available data suggest that some groups or lifestages have greater exposure to DIBP. This includes people exposed to DIBP at work, those who frequently use consumer products and/or articles containing high concentrations of DIBP, those who may have greater intake of DIBP per body weight (e.g., infants, children, adolescents) leading to greater exposure. EPA accounted for these populations with greater exposure in the draft DIBP risk evaluation as follows:

- EPA evaluated a range of OESs for workers and ONUs, including high-end exposure scenarios for females of reproductive age (a susceptible subpopulation) and average adult workers.
- EPA evaluated a range of consumer exposure scenarios, including high-intensity exposure scenarios for infants and children (susceptible subpopulations). These populations had greater intake per body weight.
- EPA evaluated a range of general population exposure scenarios, including high-end exposure scenarios for infants and children (susceptible subpopulations). These populations had greater intake per body weight.
- EPA evaluated exposure to DIBP through fish ingestion for subsistence fishers and Tribal populations.
- EPA aggregated occupational inhalation and dermal exposures for each COU for females of reproductive age (a susceptible subpopulation) and average adult workers.
- EPA aggregated consumer inhalation, dermal, and oral exposures for each COU for infants and children (susceptible subpopulations).
- EPA evaluated cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP for the U.S. civilian population using NHANES urinary biomonitoring data and reverse dosimetry for females of reproductive age (aged 16–49 years) and male children (aged 3–5, 6–11, and 12–15 years).
- For females of reproductive age, black non-Hispanic women had slightly higher 95th percentile cumulative exposures to DEHP, DBP, BBP, DIBP, and DINP compared to women of other races (e.g., white non-Hispanic, Mexican American). The 95th percentile cumulative exposure estimate for black non-Hispanic women served as the non-attributable national cumulative exposure estimate used by EPA to evaluate cumulative risk to workers and consumers.

4.4 Cumulative Risk Considerations

EPA developed a *Revised Draft Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* ([U.S. EPA, 2025ad](#)) (draft CRA TSD) for the CRA of six toxicologically similar phthalates being evaluated under section 6 of TSCA: di(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), dicyclohexyl phthalate (DCHP), diisobutyl phthalate (DIBP), and diisononyl phthalate (DINP). EPA previously issued a *Draft Proposed Approach for Cumulative Risk Assessment of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (draft 2023 approach), which outlined an approach for this assessment ([U.S. EPA, 2023c](#)). EPA's proposal was subsequently peer reviewed by the Science Advisory Committee on Chemicals (SACC) in May 2023 ([U.S. EPA, 2023e](#)). In the 2023 draft approach, EPA identified a cumulative chemical group and PESS [15 U.S.C. § 2605(b)(4)]. Based on toxicological similarity and induced effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome, EPA proposed a cumulative chemical group of DEHP, BBP, DBP, DCHP, DIBP, and DINP—but not diisodecyl phthalate (DIDP). This approach emphasizes a uniform measure of hazard for sensitive subpopulations, namely females of reproductive age and/or male infants and children, however additional health endpoints are known for broader populations and described in the individual non-cancer human health hazard assessments for DEHP ([U.S. EPA, 2024e](#)), DBP ([U.S. EPA, 2024c](#)), DIBP ([U.S. EPA, 2025w](#)), BBP ([U.S. EPA, 2025v](#)), DCHP ([U.S. EPA, 2024d](#)), and DINP ([U.S. EPA, 2024i](#)), including hepatic, kidney, and other developmental and reproductive toxicity.

The Agency's approach for assessing cumulative risk is described in detail in the draft revised CRA TSD ([U.S. EPA, 2025ad](#)) and incorporates feedback from the SACC ([U.S. EPA, 2023e](#)) on EPA's 2023 draft proposal ([U.S. EPA, 2023c](#)). EPA is focusing its CRA on acute duration exposures of females of reproductive age, male infants, and male children to six toxicologically similar phthalates (*i.e.*, DEHP, DBP, BBP, DIBP, DCHP, DINP) that induce effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome. The Agency is further focusing its CRA on acute duration exposures because there is evidence that effects on the developing male reproductive system consistent with a disruption of androgen action can result from a single exposure during the critical window of development (see Section 1.5 of ([U.S. EPA, 2025ad](#)) for further details). To evaluate cumulative risk, EPA is using a relative potency factor (RPF) approach. RPFs for DEHP, DBP, BBP, DIBP, DCHP, and DINP were developed using a meta-analysis and benchmark dose (BMD) modeling approach based on a uniform measure (*i.e.*, reduced fetal testicular testosterone). EPA is also using NHANES data to supplement—not substitute—evaluations for exposure scenarios for TSCA COUs to provide non-attributable, total exposure for addition to the relevant scenarios presented in the individual risk evaluations.

The analogy of a “risk cup” is used throughout this document to describe cumulative exposure estimates. The risk cup term is used to help conceptualize the contribution of various phthalate exposure routes and pathways to overall cumulative risk estimates and serves primarily as a communication tool. The term/concept describes exposure estimates where the full cup represents the total exposure that leads to risk (cumulative MOE) and each chemical contributes a specific amount of exposure that adds a finite amount of risk to the cup. A full risk cup indicates that the cumulative MOE has dropped below the benchmark MOE (*i.e.*, total UF), whereas cumulative MOEs above the benchmark indicate that only a percentage of the risk cup is full.

The remainder of the draft human health CRA is organized as follows:

- Section 4.4.1 – Describes the approach used by EPA to derive draft relative potency factors for DEHP, DBP, BBP, DIBP, DCHP, and DINP based on reduced fetal testicular testosterone, which are used by EPA as part of the current CRA and to assess exposures to individual phthalates by scaling to an index chemical (RPF analysis). Section 2 of EPA’s draft revised CRA TSD ([U.S. EPA, 2025ad](#)) provides more details.
- Section 4.4.2 – Briefly describes the approach used by EPA to calculate cumulative non-attributable phthalate exposure for the U.S. population using NHANES urinary biomonitoring and reverse dosimetry. Section 4 of EPA’s draft revised CRA TSD ([U.S. EPA, 2025ad](#)) provides additional details.
- Section 4.4.3 – Describes how EPA combined exposures to DIBP from individual consumer and occupational COUs/OES with cumulative non-attributable phthalate exposures from NHANES to estimate cumulative risk. An empirical example is also provided. Section 5 of EPA’s draft revised CRA TSD ([U.S. EPA, 2025ad](#)) provides additional details.
- Sections 4.4.4 through 4.4.6 – Summarize risk estimates for workers, consumers, and the general population based on relative potency assumptions.

For additional details regarding EPA’s draft CRA, readers are directed to the following TSDs:

- *Revised Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* ([U.S. EPA, 2025ad](#));
- *Draft Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* ([U.S. EPA, 2024b](#));
- *Draft Proposed Approach for Cumulative Risk Assessment of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* ([U.S. EPA, 2023c](#));
- *Draft Proposed Principles of Cumulative Risk Assessment under the Toxic Substances Control Act* ([U.S. EPA, 2023d](#)); and
- *Science Advisory Committee on Chemicals Meeting Minutes and Final Report, No. 2023-01 – A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Draft Proposed Principles of Cumulative Risk Assessment (CRA) Under the Toxic Substances Control Act and a Draft Proposed Approach for CRA of High-Priority Phthalates and a Manufacturer-Requested Phthalate* ([U.S. EPA, 2023e](#)).

4.4.1 Hazard Relative Potency

This section briefly summarizes the RPF approach used by EPA to evaluate phthalates for cumulative risk. Section 4.4.1.1 provides a brief overview and background for the RPF approach methodology, while Section 4.4.1.2 provides a brief overview of the draft RPFs derived by EPA for DEHP, DBP, BBP, DIBP, DCHP, and DINP based on decreased fetal testicular testosterone. Further details regarding the draft relative potency analysis conducted by EPA are provided in the following two TSDs:

- *Revised Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* ([U.S. EPA, 2025ad](#)); and

- *Draft Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP) (U.S. EPA, 2024b).*

4.4.1.1 Relative Potency Factor Approach Overview

For the RPF approach, chemicals being evaluated require (1) data that support toxicologic similarity (*e.g.*, components of a mixture share a known or suspected common MOA or share a common apical endpoint/effect); and (2) have dose-response data for the effect of concern over similar exposure ranges (U.S. EPA, 2023a, 2000, 1986). RPF values account for potency differences among chemicals in a mixture and scale the dose of one chemical to an equitoxic dose of another chemical (*i.e.*, the index chemical). The chemical selected as the index chemical is often among the best characterized toxicologically and considered to be representative of the type of toxicity elicited by other components of the mixture. Implementing an RPF approach requires a quantitative dose-response assessment for the index chemical and pertinent data that allow the potency of the mixture components to be meaningfully compared to that of the index chemical. In the RPF approach, RPFs are calculated as the ratio of the potency of the individual component to that of the index chemical using either (1) the response at a fixed dose, or (2) the dose at a fixed response (Equation 4-3).

Equation 4-3. Calculating RPFs

$$RPF_i = \frac{BMD_{R-IC}}{BMD_{R-i}}$$

Where:

<i>BMD</i>	=	Benchmark dose (mg/kg/day)
<i>R</i>	=	Magnitude of response (<i>i.e.</i> , benchmark response)
<i>i</i>	=	<i>i</i> th chemical
<i>IC</i>	=	Index chemical

After scaling the chemical component doses to the potency of the index chemical, the scaled doses are summed and expressed as index chemical equivalents for the mixture (Equation 4-4).

Equation 4-4. Calculating Index Chemical Equivalents

$$Index\ Chemical\ Equivalents_{MIX} = \sum_{i=1}^n d_i \times RPF_i$$

Where:

<i>Index chemical equivalents</i>	=	Dose of the mixture in index chemical equivalents (mg/kg/day)
<i>d_i</i>	=	Dose of the <i>i</i> th chemical in the mixture (mg/kg/day)
<i>RPF_i</i>	=	Relative potency factor of the <i>i</i> th chemical in the mixture (unitless)

Non-cancer risk associated with exposure to an individual chemical or the mixture can then be assessed by calculating an MOE, which in this case is the ratio of the index chemical's non-cancer hazard value (*e.g.*, the BMDL) to an estimate of exposure expressed in terms of index chemical equivalents. The MOE is then compared to the benchmark MOE (*i.e.*, the total uncertainty factor associated with the assessment) to characterize risk.

4.4.1.2 Relative Potency Factors

Derivation of Draft RPFs

To derive RPFs for DEHP, DBP, BBP, DIBP, DCHP, and DINP, EPA utilized a meta-analysis and BMD modeling approach similar to that used by NASEM (2017) to model decreased fetal testicular testosterone. As described further in EPA's *Draft Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for DEHP, DBP, BBP, DIBP, and DCHP* (U.S. EPA, 2024b), the Agency evaluated benchmark responses (BMRs) of 5, 10, and 40 percent. EPA estimated RPFs at the 5, 10, and 40 percent response levels. However, RPFs could not be estimated for BBP at the 5 or 10 percent response levels or for DIBP at the 5 percent response level because BMDs could not be estimated for BBP or DIBP at these response levels due to lack of data at the low-end range of the dose-response curve. Therefore, for input into the CRA of phthalates, EPA has selected draft RPFs using BMD₄₀ estimates, as this was the only response level in which a full set of RPFs could be derived for all phthalates being evaluated (Table 4-19). There is some uncertainty in the applicability of the selected RPFs for DIBP and BBP at the low response levels (*i.e.*, 5–10% changes). However, the lack of variability in calculated RPFs for DEHP (RPFs ranged from 0.82–0.84), DCHP (RPFs ranged from 1.66–1.71), and DINP (RPFs ranged from 0.19–0.21) across response levels, and the fact that the RPF for DIBP was 0.53 at both the 10 and 40 percent response levels, increases EPA's confidence in the selected RPFs for BBP and DIBP. For further details regarding RPFs derivation, see Section 2 of EPA's *Revised Draft Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ad).

Selection of the Index Chemical

As described further in Section 2 of EPA's draft revised TSD for CRA, *EPA has preliminarily selected DBP as the index chemical*. DBP has a high-quality toxicological database of studies demonstrating effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome. Furthermore, studies of DBP demonstrate toxicity representative of all phthalates in the cumulative chemical group and DBP is well characterized for the MOA associated with phthalate syndrome. Finally, compared to other phthalates, including well-studied phthalates such as DEHP, DBP has the most dose-response data available in the low-end range of the dose-response curve where the BMD₅ and BMDL₅ are derived, which provides a robust and scientifically sound foundation of BMD and BMDL estimates on which the RPF approach is based.

Table 4-19. Draft Relative Potency Factors Based on Decreased Fetal Testicular Testosterone

Phthalate	BMD ₄₀ (mg/kg-day)	RPF Based on BMD ₄₀
DBP (Index chemical)	149	1.0
DEHP	178	0.84
DIBP	279	0.53
BBP	284	0.52
DCHP	90	1.66
DINP	699	0.21

Index Chemical POD

As with any risk assessment that relies on BMD analysis, the POD is the lower confidence limit used to mark the beginning of extrapolation to determine risk associated with human exposures. As described further in the non-cancer human health hazards of DEHP (U.S. EPA, 2024e), DBP (U.S. EPA, 2024c),

BBP ([U.S. EPA, 2025v](#)), DIBP ([U.S. EPA, 2025w](#)), DCHP ([U.S. EPA, 2024d](#)), and DINP ([U.S. EPA, 2024i](#)) (see Appendices titled “Considerations for Benchmark Response (BMR) Selection for Reduced Fetal Testicular Testosterone” in each hazard assessment), EPA has reached the conclusion that a BMR of 5 percent is the most appropriate and health protective response level for evaluating decreased fetal testicular testosterone as the basis of the POD (as noted above, RPFs are based on a 40% response level). For the index chemical, DBP, the BMDL₅ for the best fitting linear-quadratic model is 9 mg/kg-day for reduced fetal testicular. Using allometric body weight scaling to the ³/₄-power ([U.S. EPA, 2011c](#)), EPA extrapolated an HED of 2.1 mg/kg-day to use as the POD for the index chemical in the CRA.

Selection of the Benchmark MOE

Consistent with Agency guidance ([U.S. EPA, 2022c, 2002b](#)), EPA selected an intraspecies uncertainty factor (UF_H) of 10, which accounts for variation in susceptibility across the human population and the possibility that the available data might not be representative of individuals who are most susceptible to the effect. EPA used allometric body weight scaling to the three-quarters power to derive an HED of 2.1 mg/kg-day DBP, which accounts for species differences in toxicokinetics. Consistent with EPA Guidance ([U.S. EPA, 2011c](#)), the interspecies uncertainty factor (UF_A), was reduced from 10 to 3 to account remaining uncertainty associated with interspecies differences in toxicodynamics. Overall, a total uncertainty factor of 30 was selected for use as the benchmark margin of exposure for the CRA (based on an interspecies uncertainty factor [UF_A] of 3 and an intraspecies uncertainty factor [UF_H] of 10).

Weight of Scientific Evidence

EPA has preliminary selected an HED of 2.1 mg/kg-day (BMDL₅ of 9 mg/kg-day) as the index chemical (DBP) POD. This POD is based on a meta-analysis and BMD modeling of decreased fetal testicular testosterone from eight studies of rats gestationally exposed to DBP. The Agency has also derived draft RPFs of 1, 0.84, 0.53, 0.52, 1.66, and 0.21 for DBP (index chemical), DEHP, DIBP, BBP, DCHP, and DINP, respectively, based on a common toxicological outcome (*i.e.*, reduced fetal testicular testosterone). EPA has robust overall confidence in the proposed POD for the index chemical (*i.e.*, DBP) and the derived draft RPFs.

Application of RPF provides a more robust basis for assessing the dose-response to the common hazard endpoint across all assessed phthalates. For DIBP and a subset of the phthalates with a more limited toxicological dataset, scaling by the RPF and application of the index chemical POD provides a more sensitive and robust hazard assessment than the chemical-specific POD. Readers are directed to EPA’s draft revised TSD for CRA ([U.S. EPA, 2025ad](#)) for a discussion of the weight of evidence supporting EPA’s preliminary conclusions.

4.4.2 Cumulative Phthalate Exposure: Non-Attributable Cumulative Exposure to DEHP, DBP, BBP, DIBP, and DINP Using NHANES Urinary Biomonitoring and Reverse Dosimetry

This section briefly summarizes EPA’s approach and results for estimating non-attributable cumulative exposure to phthalates using NHANES urinary biomonitoring data and reverse dosimetry. Readers are directed to Section 4 of EPA’s draft revised TSD for CRA ([U.S. EPA, 2025ad](#)) for additional details.

NHANES is an ongoing exposure assessment of the U.S. population’s exposure to environmental chemicals using biomonitoring. The NHANES biomonitoring dataset is a national, statistical representation of the general, non-institutionalized, civilian U.S. population. CDC’s NHANES dataset provides an estimate of average aggregate exposure to individual phthalates for the U.S. population.

However, exposures measured via NHANES cannot be attributed to specific sources, such as TSCA COUs or other sources. Given the short half-lives of phthalates, neither can NHANES capture acute, low frequency exposures. Instead, as concluded by the SACC review of the draft 2023 approach, NHANES provides a “snapshot” or estimate of total, non-attributable phthalate exposure for the U.S. population and relevant subpopulations ([U.S. EPA, 2023e](#)). These estimates of total non-attributable exposure can supplement assessments of scenario-specific acute risk in individual risk evaluations.

Monoester metabolites of BBP, DBP, DEHP, DIBP, and DINP in human urine are regularly measured as part of the NHANES biomonitoring program and are generally detectable in human urine at a high frequency, including during the most recent NHANES survey period (*i.e.*, 2017–2018). One urinary metabolite (*i.e.*, monocyclohexyl phthalate [MCHP]) of DCHP was included in NHANES from 1999 through 2010 but was excluded from NHANES after 2010 due to low detection levels and a low frequency of detection in human urine (detected in <10% of samples in 2009–2010 NHANES survey) ([CDC, 2013](#)). Therefore, EPA did not use NHANES urinary biomonitoring data to estimate a daily aggregate intake value for DCHP through reverse dosimetry.

EPA used urinary phthalate metabolite concentrations for DEHP, DBP, BBP, DIBP, and DINP measured in the most recently available NHANES survey (2017–2018) to estimate the average daily aggregate intake of each phthalate through reverse dosimetry for

- Females of reproductive age (16–49 years);
- Male children (4 to <6 years, used as a proxy for male infants and toddlers);
- Male children (6–11 years); and
- Male children (12 to <16 years).

Since NHANES does not include urinary biomonitoring for infants or toddlers, and other national datasets are not available, EPA used biomonitoring data from male children 3 to less than 6 years of age as a proxy for male infants (<1 year) and male toddlers (1–2 years). See Section 4 of ([U.S. EPA, 2025ad](#)) for further details regarding the reverse dosimetry approach. Aggregate daily intake estimates for these populations are presented in Table 4-20.⁷ Aggregate daily intake values were also calculated for females of reproductive age stratified by race and socioeconomic status (Table 4-21). A similar analysis by race was not done for male children because the NHANES sample size is smaller for this population.

Aggregate daily intake values for each phthalate were then scaled by relative potency using the RPFs in Table 4-19, expressed in terms of index chemical (DBP) equivalents, and summed to estimate cumulative daily intake in terms of index chemical (DBP) equivalents using the approach outlined in Sections 4.4.1 and 4.4.3.

Since EPA is focusing its CRA on acute exposure durations, EPA selected 95th percentile exposure estimates from NHANES to serve as the non-attributable nationally representative exposure estimate for use in its CRA. For females of reproductive age, EPA’s analysis indicates that black, non-Hispanic women have slightly higher 95th percentile cumulative phthalate exposure compared to other racial groups; thus, 95th percentile cumulative exposure estimates for black non-Hispanic females of reproductive age was selected for use in the CRA of DIBP (Table 4-21).

⁷ EPA defines *aggregate exposure* as the “combined exposures to an individual from a single chemical substance across multiple routes and across multiple pathways” ([40 CFR 702.33](#)).

The 95th percentile of national cumulative exposure serves as the estimate of non-attributable phthalate exposure for its CRA of DIBP as follows:

- Females of reproductive age (16–49 years, black Non-Hispanic): 5.16 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to worker and consumer females of reproductive age in Section 4.4.4 and Section 4.4.5.
- Males (3–5 years): 10.8 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to consumer male infants (<1 year), toddlers (1–2 years), and preschoolers (3–5 years) in Section 4.4.5. Since NHANES does not include urinary biomonitoring for infants (<1 year) or toddlers (1–2 years), and other national datasets are not available, EPA used biomonitoring data from male children (3 to <6 years) as a proxy for male infants and toddlers.
- Males (6–11 years): 7.35 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to consumer male children (6–10 years) in Section 4.4.5.
- Males (12–15 years): 4.36 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to consumer male teenagers (11–15 years) in Section 4.4.5.

4.4.2.1 Weight of Scientific Evidence: Non-Attributable Cumulative Exposure to Phthalates

Overall, EPA has robust confidence in the derived estimates of non-attributable cumulative exposure from NHANES urinary biomonitoring using reverse dosimetry.

The Agency EPA used urinary biomonitoring data from the CDC's national NHANES dataset, which provides a statistical representation of the general, non-institutionalized, civilian U.S. population. To estimate daily intake values from urinary biomonitoring for each phthalate, EPA used reverse dosimetry. The reverse dosimetry approach used by EPA has been used extensively in the literature and has been used by the U.S. CPSC (2014) and Health Canada (Health Canada, 2020) to estimate phthalate daily intake values from urinary biomonitoring data. However, given the short half-lives of phthalates, NHANES biomonitoring data are not expected to capture low frequency exposures and may be an underestimate of acute phthalate exposure.

Table 4-20. Cumulative Phthalate Daily Intake (µg/kg-day) Estimates for Females of Reproductive Age, Male Children, and Male Teenagers from the 2017–2018 NHANES Cycle

Population	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30) ^a
Females (16–49 years; n = 1,620)	50	DBP	0.21	1	0.210	22.1	0.950	2,211	1.4%
		DEHP	0.53	0.84	0.445	46.9			
		BBP	0.08	0.52	0.042	4.38			
		DIBP	0.2	0.53	0.106	11.2			
		DINP	0.7	0.21	0.147	15.5			
	95	DBP	0.61	1	0.610	17.2	3.55	592	5.1%
		DEHP	1.48	0.84	1.24	35.0			
		BBP	0.42	0.52	0.218	6.15			
		DIBP	0.57	0.53	0.302	8.51			
		DINP	5.6	0.21	1.18	33.1			
Males (3–5 years; n = 267)	50	DBP	0.56	1	0.560	18.4	3.04	690	4.3%
		DEHP	2.11	0.84	1.77	58.2			
		BBP	0.22	0.52	0.114	3.76			
		DIBP	0.57	0.53	0.302	9.93			
		DINP	1.4	0.21	0.294	9.66			
	95	DBP	2.02	1	2.02	18.6	10.8	194	15.5%
		DEHP	6.44	0.84	5.41	49.9			
		BBP	2.46	0.52	1.28	11.8			
		DIBP	2.12	0.53	1.12	10.4			
		DINP	4.8	0.21	1.01	9.30			
Males (6–11 years; n = 553)	50	DBP	0.38	1	0.380	20.1	1.89	1,111	2.7%
		DEHP	1.24	0.84	1.04	55.1			
		BBP	0.16	0.52	0.083	4.40			
		DIBP	0.33	0.53	0.175	9.26			
		DINP	1	0.21	0.210	11.1			

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Population	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30) ^a
	95	DBP	1.41	1	1.41	19.2	7.35	286	10.5%
		DEHP	4.68	0.84	3.93	53.5			
		BBP	0.84	0.52	0.437	5.94			
		DIBP	1.62	0.53	0.859	11.7			
		DINP	3.4	0.21	0.714	9.71			
Males (12–15 years; n = 308)	50	DBP	0.33	1	0.330	27.6	1.19	1,758	1.7%
		DEHP	0.66	0.84	0.554	46.4			
		BBP	0.14	0.52	0.073	6.09			
		DIBP	0.21	0.53	0.111	9.32			
		DINP	0.6	0.21	0.126	10.5			
	95	DBP	0.62	1	0.620	14.2	4.36	482	6.2%
		DEHP	2.51	0.84	2.11	48.3			
		BBP	0.64	0.52	0.333	7.63			
		DIBP	0.59	0.53	0.313	7.17			
		DINP	4.7	0.21	0.987	22.6			

^a A cumulative exposure of 70 µg DBP equivalents/kg-day would result in a cumulative MOE of 30 (*i.e.*, 2,100 µg DBP-equivalents/kg-day ÷ 70 µg DBP equivalents/kg-day = 30), which is equivalent to the benchmark of 30, indicating that the exposure is at the threshold for risk. Therefore, to estimate the percent contribution to the risk cup, the cumulative exposure expressed in DBP equivalents is divided by 70 µg DBP equivalents/kg-day to estimate percent contribution to the risk cup.

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Table 4-21. Cumulative Phthalate Daily Intake (µg/kg-day) Estimates for Females of Reproductive Age (16–49 Years Old) by Race and Socioeconomic Status from the 2017–2018 NHANES Cycle

Race/ Socioeconomic Status (SES)	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30) ^a
Race: white non-Hispanic (n = 494)	50	DBP	0.22	1	0.22	21.6	1.02	2,058	1.5%
		DEHP	0.59	0.84	0.50	48.6			
		BBP	0.10	0.52	0.05	5.1			
		DIBP	0.20	0.53	0.11	10.4			
		DINP	0.70	0.21	0.15	14.4			
	95	DBP	0.58	1	0.58	17.6	3.30	636	4.7%
		DEHP	1.44	0.84	1.21	36.6			
		BBP	0.29	0.52	0.15	4.6			
		DIBP	0.55	0.53	0.29	8.8			
		DINP	5.10	0.21	1.07	32.4			
Race: black non-Hispanic (n = 371)	50	DBP	0.10	1	0.10	15.0	0.667	3,151	1.0%
		DEHP	0.38	0.84	0.32	47.9			
		BBP	0.04	0.52	0.02	3.1			
		DIBP	0.15	0.53	0.08	11.9			
		DINP	0.70	0.21	0.15	22.1			
	95	DBP	0.48	1	0.48	9.3	5.16	407	7.4%
		DEHP	4.28	0.84	3.60	69.7			
		BBP	0.30	0.52	0.16	3.0			
		DIBP	0.40	0.53	0.21	4.1			
		DINP	3.40	0.21	0.71	13.8			

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Race/ Socioeconomic Status (SES)	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30) ^a
Race: Mexican American (n = 259)	50	DBP	0.19	1	0.19	22.4	0.849	2,474	1.2%
		DEHP	0.49	0.84	0.41	48.5			
		BBP	0.06	0.52	0.03	3.7			
		DIBP	0.17	0.53	0.09	10.6			
		DINP	0.60	0.21	0.13	14.8			
	95	DBP	0.42	1	0.42	11.6	3.61	582	5.2%
		DEHP	1.24	0.84	1.04	28.9			
		BBP	0.39	0.52	0.20	5.6			
		DIBP	0.46	0.53	0.24	6.8			
		DINP	8.10	0.21	1.70	47.1			
Race: Other (n = 496)	50	DBP	0.26	1	0.26	25.3	1.03	2041	1.5%
		DEHP	0.64	0.84	0.54	52.2			
		BBP	0.07	0.52	0.04	3.5			
		DIBP	0.15	0.46	0.07	6.7			
		DINP	0.60	0.21	0.13	12.2			
	95	DBP	0.84	1	0.84	20.7	4.06	517	5.8%
		DEHP	1.37	0.84	1.15	28.3			
		BBP	0.41	0.52	0.21	5.2			
		DIBP	0.46	0.53	0.24	6.0			
SES: Below poverty level (n = 1,056)	50	DBP	0.21	1	0.21	22.0	0.955	2,199	1.4%
		DEHP	0.53	0.84	0.45	46.6			
		BBP	0.09	0.52	0.05	4.9			
		DIBP	0.20	0.53	0.11	11.1			
		DINP	0.70	0.21	0.15	15.4			
	95	DBP	0.82	1	0.82	18.2	4.50	467	6.4%
		DEHP	1.75	0.84	1.47	32.7			
		BBP	0.34	0.52	0.18	3.9			

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Race/ Socioeconomic Status (SES)	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30) ^a
		DIBP	0.51	0.53	0.27	6.0			
		DINP	8.40	0.21	1.76	39.2			
SES: At or above poverty level (n = 354)	50	DBP	0.20	1.00	0.20	27.9	0.718	2,924	1.0%
		DEHP	0.31	0.84	0.26	36.3			
		BBP	0.06	0.52	0.03	4.3			
		DIBP	0.15	0.53	0.08	11.1			
		DINP	0.70	0.21	0.15	20.5			
	95	DBP	0.48	1.00	0.48	16.3	2.94	713	4.2%
		DEHP	1.07	0.84	0.90	30.5			
		BBP	0.45	0.52	0.23	7.9			
		DIBP	0.65	0.53	0.34	11.7			
		DINP	4.70	0.21	0.99	33.5			
SES: Unknown (n = 210)	50	DBP	0.26	1.00	0.26	23.2	1.12	1,870	1.6%
		DEHP	0.67	0.84	0.56	50.1			
		BBP	0.06	0.52	0.03	2.8			
		DIBP	0.23	0.53	0.12	10.9			
		DINP	0.70	0.21	0.15	13.1			
	95	DBP	0.60	1.00	0.60	25.5	2.35	893	3.4%
		DEHP	0.86	0.84	0.72	30.7			
		BBP	0.21	0.52	0.11	4.6			
		DIBP	0.35	0.53	0.19	7.9			
		DINP	3.50	0.21	0.74	31.2			

^a A cumulative exposure of 70 µg DBP equivalents/kg-day would result in a cumulative MOE of 30 (*i.e.*, 2,100 µg DBP-equivalents/kg-day ÷ 70 µg DBP equivalents/kg-day = 30), which is equivalent to the benchmark of 30, indicating that the exposure is at the threshold for risk. Therefore, to estimate the percent contribution to the risk cup, the cumulative exposure expressed in DBP equivalents is divided by 70 µg DBP equivalents/kg-day to estimate percent contribution to the risk cup.

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4.4.3 Estimation of Risk Based on Relative Potency

As described in the draft revised TSD for CRA ([U.S. EPA, 2025ad](#)), EPA is focusing its exposure assessment for the CRA for DIBP on evaluation of exposures through individual TSCA consumer and occupational DIBP COUs as well as non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data and reverse dosimetry. As described in the *Revised Draft Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP under TSCA* ([U.S. EPA, 2025ad](#)), EPA is considering two options for characterizing cumulative risk. Herein, EPA uses the first option to estimate cumulative risk in which all phthalate exposures are scaled by relative potency using the RPFs presented in Table 4-19 to express phthalate exposure in terms of index chemical (DBP) equivalents. Exposures from individual DIBP consumer or worker COUs/OES were then combined to estimate cumulative risk. Cumulative risk was estimated using the four-step process outlined below, along with one empirical example of how EPA calculated cumulative risk for one occupational OES for DIBP (i.e., Rubber converting). In the second option, which is presented in Section 5.2 of ([U.S. EPA, 2025ad](#)), individual phthalate exposures for consumer and occupational COUs are not scaled by relative potency factors but use the individual phthalate hazard values and are combined with non-attributable cumulative exposures estimated using NHANES. Both options for calculating cumulative risk will be peer-reviewed by the SACC in 2025. Following peer review and public comment, EPA will select one option for characterizing cumulative risk in the final DIBP risk evaluation.

Step 1: Convert DIBP Exposure Estimates from Each Individual Consumer and Occupational COU to Index Chemical Equivalents (i.e., Occupational and Consumer Exposure from Sections 4.1.1 and 4.1.2, Respectively)

In this step, DIBP acute duration exposure estimates from each consumer and occupational COU/OES are scaled by relative potency and expressed in terms of index chemical (DBP) equivalents using Equation 4-5. This step is repeated for all individual exposure estimates for each route of exposure being assessed for each COU (i.e., inhalation and dermal exposures for occupational COUs; inhalation, ingestion, and dermal exposure for consumer COUs).

Equation 4-5. Scaling DIBP Exposures by Relative Potency

$$DIBP \text{ Exposure (in DBP equivalents)} = AD_{Route\ 1} \times RPF_{DIBP}$$

Where:

$DIBP \text{ exposure}$	=	Acute exposure for a given route of exposure from a single occupational or consumer COU expressed in terms of $\mu\text{g/kg}$ index chemical (DBP) equivalents
$AD_{Route\ 1}$	=	Acute dose in $\mu\text{g/kg}$ from a given route of exposure from a single occupational or consumer COU/OES
RPF_{DIBP}	=	The relative potency factor (unitless) for DIBP, which is 0.53 (Table 4-19).

Example: 50th percentile inhalation and dermal DIBP exposures for female workers of reproductive age are 6.90 and 8.22 $\mu\text{g/kg}$ for the Rubber Converting OES ([U.S. EPA, 2025t](#)). Using Equation 4-5, inhalation, dermal, and aggregate DIBP exposures for this OES can be scaled by relative potency to 3.66, 4.36, and 8.02 $\mu\text{g/kg}$ DBP equivalents, respectively.

$$DIBP_{Inhalation-COU} = 3.66 \mu\text{g/kg DBP equivalents} = 6.90 \mu\text{g/kg DIBP} \times 0.53$$

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$$DIBP_{Dermal-COU} = 4.36 \mu\text{g/kg DBP equivalents} = 8.22 \mu\text{g/kg DIBP} \times 0.53$$

$$DIBP_{Aggregate-COU} = 8.02 \mu\text{g/kg DBP equivalents} \\ = (6.90 \mu\text{g/kg DIBP} + 8.22 \mu\text{g/kg DIBP}) \times 0.53$$

Step 2: Estimate Non-Attributable Cumulative Exposure to DEHP, DBP, BBP, DIBP, and DINP Using NHANES Urinary Biomonitoring Data and Reverse Dosimetry (See Section 4.4.2 for Further Details)

Non-attributable exposure for a national population to DEHP, DBP, BBP, DIBP, and DINP was estimated using Equation 4-6, where individual phthalate daily intake values estimated from NHANES biomonitoring data and reverse dosimetry were scaled by relative potency, expressed in terms of index chemical (DBP) equivalents, and summed to estimate non-attributable cumulative exposure in terms of DBP equivalents. Equation 4-6 was used to calculate the cumulative exposure estimates provided in Table 4-20 and Table 4-21.

Equation 4-6. Estimating Non-Attributable Cumulative Exposure to DEHP, DBP, BBP, DIBP, and DINP

$$\begin{aligned} \text{Cumulative Exposure (Non – attributable)} \\ = (DI_{DEHP} \times RPF_{DEHP}) + (DI_{DBP} \times RPF_{DBP}) + (DI_{BBP} \times RPF_{BBP}) \\ + (DI_{DIBP} \times RPF_{DIBP}) + (DI_{DINP} \times RPF_{DINP}) \end{aligned}$$

Where:

<i>Cumulative exposure (non-attributable)</i>	=	Expressed in index chemical (DBP) equivalents (μg/kg-day)
<i>DI</i>	=	Daily intake values (μg/kg-day) for each phthalate were calculated using NHANES urinary biomonitoring data; DI values for each phthalate and assessed population are provided in Table 4-20 and Table 4-21).
<i>RPF</i>	=	All relative potency factors (unitless) are listed in Table 4-19.

Example: The 95th percentile cumulative exposure estimate of 5.16 μg/kg-day DBP equivalents for black, non-Hispanic females of reproductive age (Table 4-21) is calculated using Equation 4-6 as follows:

$$\begin{aligned} 5.16 \mu\text{g/kg DBP equivalents} \\ = (4.28 \mu\text{g/kg DEHP} \times 0.84) + (0.48 \mu\text{g/kg DBP} \times 1) + (0.30 \mu\text{g/kg BBP} \times 0.52) \\ + (0.40 \mu\text{g/kg DIBP} \times 0.53) + (3.40 \mu\text{g/kg DINP} \times 0.21) \end{aligned}$$

Step 3: Calculate MOEs for DIBP Exposures and for Each Phthalate Exposure Included in the Cumulative Scenario

Next, MOEs are calculated for each exposure of interest that is included in the cumulative scenario using Equation 4-7. For example, this step involves calculating MOEs for inhalation and dermal DIBP exposures expressed in index chemical equivalents for each individual COU/OES in Step 1, and an MOE for non-attributable cumulative phthalate exposure from Step 2 above.

Equation 4-7. Calculating MOEs for Exposures of Interest for Use in the RPF and Cumulative Approaches

$$MOE_1 = \frac{\text{Index Chemical (DBP) POD}}{\text{Exposure}_1 \text{ in DBP Equivalents}}$$

Where:

MOE_1 (unitless) = The MOE calculated for each exposure of interest included in the cumulative scenario.
Index chemical (DBP) POD = The POD selected for the index chemical, DBP. The index chemical POD is 2,100 µg/kg (Section 4.4.1).
 $Exposure_1$ = The exposure estimate in DBP equivalents for the pathway of interest (i.e., from Step 1 or 2 above).

Example: Using Equation 4-7, the MOEs for inhalation and dermal DIBP exposure estimates for the Rubber Converting OES in DBP equivalents from Step 1 and the MOE for the non-attributable cumulative exposure estimate in DBP equivalents from Step 2 are 574, 482, and 407, respectively.

$$MOE_{\text{Cumulative Non-attributable}} = 407 = \frac{2,100 \mu\text{g/kg}}{5.16 \mu\text{g/kg}}$$

$$MOE_{\text{COU-Inhalation}} = 574 = \frac{2,100 \mu\text{g/kg}}{3.66 \mu\text{g/kg}}$$

$$MOE_{\text{COU-Dermal}} = 482 = \frac{2,100 \mu\text{g/kg}}{4.36 \mu\text{g/kg}}$$

Step 4: Calculate the Cumulative MOE

For the cumulative MOE approach, MOEs for each exposure of interest in the cumulative scenario are first calculated (Step 3). The cumulative MOE for the cumulative scenario can then be calculated using Equation 4-8, which shows the addition of MOEs for the inhalation and dermal exposures routes from an individual DIBP COU as well as the MOE for non-attributable cumulative exposure to phthalates from NHANES urinary biomonitoring and reverse dosimetry. Additional MOEs can be added to the equation as necessary (e.g., for the ingestion route for consumer scenarios).

Equation 4-8. Cumulative Margin of Exposure Calculation

$$\text{Cumulative MOE} = \frac{1}{\frac{1}{MOE_{\text{COU-Inhalation}}} + \frac{1}{MOE_{\text{COU-Dermal}}} + \frac{1}{MOE_{\text{Cumulative-Non-attributable}}} \dots}$$

Example: The cumulative MOE for the Rubber converting OES is 159 and is calculated by summing the MOEs for each exposure of interest from Step 3 as follows:

$$\text{Cumulative MOE} = 159 = \frac{1}{\frac{1}{574} + \frac{1}{482} + \frac{1}{407}}$$

4.4.4 Risk Estimates for Workers Based on Relative Potency

This section summarizes RPF analysis risk estimates for female workers of reproductive age from acute duration exposures to DIBP. In the RPF analysis, EPA focused its occupational risk assessment on this population and exposure duration because as described in Section 4.4 and the draft revised TSD for

CRA ([U.S. EPA, 2025ad](#)), this population and exposure duration is considered most directly applicable to the common hazard outcome that serves as the basis for the RPF analysis (*i.e.*, reduced fetal testicular testosterone).

To evaluate cumulative risk to female workers of reproductive age, EPA combined inhalation and dermal exposures to DIBP from each individual occupational COU/OES with non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP (estimated from NHANES biomonitoring data). As described in Section 4.4.3, for each individual phthalate exposures were scaled by relative potency per chemical, expressed in terms of index chemical (DBP) equivalents, and summed to estimate cumulative exposure and cumulative risk for each COU. MOEs in Table 4-22 are shown both with (cumulative MOE) and without (MOEs for individual DIBP COU derived using the RPF analysis) the addition of non-attributable cumulative exposure (estimated from NHANES using reverse dosimetry) to allow comparisons of MOEs scaled by relative potency.

Table 4-22 summarizes the acute duration central tendency and high-end MOEs for female workers of reproductive age used to characterize cumulative risk from exposure to DCHP, DEHP, DBP, BBP, DIBP, and DINP, as well as DIBP MOEs scaled by relative potency without non-attributable cumulative exposure (*i.e.*, NHANES) included. MOE calculations are also provided in the *Draft Occupational and Consumer Cumulative Risk Calculator for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025x](#)). High-end cumulative MOEs for female workers of reproductive age were above (ranging from 34–233) the benchmark of 30 for 15 of 19 OESs evaluated for DIBP (see list below). As discussed in Section 4.3.2, high-end and central tendency MOEs for female workers of reproductive age were below the benchmark of 30 for 2 of 19 (*i.e.*, Spray application of paints and coatings and Spray application of adhesives and sealants) of 19 OESs evaluated for DIBP as part of the individual chemical assessment (see list below). Addition of non-attributable cumulative national exposure (from NHANES) would have no influence on high-end or central tendency risk conclusions for these two OESs. For the remaining two OES (*i.e.*, Rubber compounding and Rubber converting), which had high-end aggregate MOEs exceeding the benchmark of 30 in the individual DIBP assessment (Section 4.3.2), high-end cumulative MOEs were below the benchmark of 30 (listed below). For all OESs, the Agency presents MOEs for each individual exposure route. That is, MOEs resulting from inhalation and dermal DIBP exposures for each COU/OES scaled to index chemical (DBP) equivalents (*i.e.*, the RPF analysis) as well as cumulative occupational exposure (*i.e.*, aggregate exposure to DIBP from a single COU [in index chemical equivalents] combined with cumulative national exposure [in index chemical equivalents]), so that the contribution of each exposure to the cumulative MOE can be discerned.

COUs/OES with High-End and Central Tendency Aggregate MOEs from the Individual Chemical Assessment Ranging from 1.9–20

As can be seen from Table 4-17, high-end and central tendency aggregate MOEs ranged from 1.9 to 20 for COUs covered under 2 of the 19 OESs evaluated in the individual DIBP assessment. Addition of non-attributable cumulative national exposure (from NHANES) would have no influence on high-end or central tendency risk conclusions for these two OESs and therefore these OES are not further discussed.

- Application of paints and coatings – spray application; and
- Application of adhesives and sealants – spray application.

COUs/OES with High-End Cumulative MOEs Ranging from 34–233

As can be seen from Table 4-22, cumulative acute high-end MOEs ranged from 34 to 233 for COUs covered under 15 OES (benchmark = 30), including:

- Manufacturing (cumulative MOE = 207);

- Import and repackaging (cumulative MOE = 207);
- Incorporation into adhesives and sealants (cumulative MOE = 207);
- Incorporation into paints and coatings (cumulative MOE = 207);
- Formulation into pre-catalyst (cumulative MOE = 207);
- Intermediate in polypropylene manufacturing (cumulative MOE = 207);
- Plastic compounding (cumulative MOE = 203);
- Plastics converting (cumulative MOE = 59); Application of paints and coatings – non-spray application (cumulative MOE = 207);
- Application of adhesives and sealants – non-spray application (cumulative MOE = 207);
- Use of laboratory chemicals (liquids) (cumulative MOE = 207);
- Use of laboratory chemicals (solids) (cumulative MOE = 233);
- Recycling (cumulative MOE = 34);
- Waste handling, treatment, and disposal (cumulative MOE = 32); and
- Fabrication or use of final products and articles (cumulative MOE = 52).

OES with a High-End Cumulative MOE of 25

As can be seen from Table 4-22, cumulative acute high-end MOEs were below 30 for COUs covered by one OES:

- Rubber compounding (high-end and central tendency cumulative MOEs of 25 and 159); and
- Rubber converting (high-end and central tendency cumulative MOEs of 27 and 197).

EPA characterizes the preceding 19 OESs as part of the individual DIBP assessment in Section 4.3.2. For two OESs (*i.e.*, Rubber compounding and Rubber converting), the high-end and central tendency acute aggregate MOEs for females of reproductive age are 41 and 551 (rubber converting) and 39 and 331 (rubber compounding) (Table 4-16), respectively, from exposure to DIBP alone, while the high-end and central tendency cumulative MOEs are 27 and 197 (rubber converting) and 25 and 147 (rubber compounding), respectively (Table 4-22). Three factors contribute to the lower cumulative MOEs compared to the acute aggregate high-end and central tendency MOE for female workers of reproductive age, including:

- *Scaling by Relative Potency*: DIBP inhalation and dermal exposures for the OES was scaled by relative potency to the index chemical. The RPF for DIBP is 0.53 (Table 4-19), which means DIBP exposures when multiplied by the RPF and expressed in terms of index chemical (DBP) equivalents, decreased by 47 percent. RPFs used to scale for relative potency were calculated based on a common hazard endpoint (*i.e.*, reduced fetal testicular testosterone) from data from multiple studies evaluating effects of phthalates on fetal testicular testosterone using a meta-analysis and BMD modeling approach for each of the six phthalates included in the cumulative chemical group (see ([U.S. EPA, 2025ad](#)) for further details). This analysis provides a robust basis for assessing the dose-response for the common hazard endpoint (*i.e.*, reduced fetal testicular testosterone) across the six toxicologically similar phthalates included in the cumulative assessment. Overall, EPA has robust confidence in the draft RPFs used in this CRA (Section 4.4.1).
- *Index Chemical POD*: As described previously in Sections 4.4.1 and 4.4.3, cumulative MOEs are calculated by dividing the cumulative exposure estimate expressed in terms of index chemical (DBP) equivalents by the index chemical POD. The POD for the index chemical (DBP) used to calculate cumulative risk is 2.1 mg/kg (based on a BMDL₅ for reduced fetal testicular testosterone). Comparatively, the DIBP POD used to calculate MOEs for individual DIBP COUs in Section 4.3.2 is 5.7 mg/kg (based on a BMDL₅ for reduced fetal testicular testosterone). *The index chemical (DBP) POD is approximately 2.7-fold lower (i.e., more sensitive) than the*

individual DIBP POD, which is the primary factor leading to lower cumulative MOEs. Overall, EPA has robust confidence in the index chemical (DBP) POD used in this CRA. This is because the POD is based on fetal testicular testosterone data from eight publications that was integrated via meta-analysis and BMD modeling. Notably, several of the available studies evaluated effects on fetal testicular testosterone at dose levels in the low-end range of the dose response curve (i.e., 1, 10, 33, and 50 mg/kg-day) where the BMD₅ (14 mg/kg-day) and BMDL₅ (9 mg/kg-day) were derived (see ([U.S. EPA, 2025ad](#)) for further details).

- *Addition of Non-Attributable Cumulative Exposure:* As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data from the 2017 to 2018 survey (most recent dataset available) and reverse dosimetry (see Section 4.4.2 and ([U.S. EPA, 2025ad](#)) for further details), representing exposure to a national population. DCHP was not included as part of the cumulative non-attributable national exposure estimate because DCHP has not been included in NHANES analyses since 2011 due to low frequencies of detection and low detection levels in urine (Section 4.4.2). Non-attributable cumulative exposure estimates were scaled by relative potency and expressed in index chemical (DBP) equivalents. Non-attributable cumulative exposure was then combined with acute inhalation and dermal DIBP exposures for each individual OES scaled by relative potency. For female workers of reproductive age, EPA added a non-attributable cumulative exposure of 5.16 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE. This non-attributable cumulative exposure estimate is the 95th percentile estimate for black non-Hispanic females of reproductive age (16–49 years). *This non-attributable cumulative exposure contributes approximately 7.4 percent to the risk cup with a benchmark MOE of 30.* Overall, EPA has robust confidence in the non-attributable cumulative exposure estimate since it was calculated from CDC’s NHANES biomonitoring dataset, which provides a statistically representative sampling of the U.S. civilian population. Furthermore, the Agency used a well-established reverse dosimetry approach to calculate phthalate daily intake values from urinary biomonitoring data.

For the two OES showing cumulative risk (i.e., Rubber converting and Rubber compounding), scaling acute aggregate exposures by relative potency and using the index chemical POD to calculate an MOE led to acute MOEs of 27 to 28 (benchmark = 30), whereas the acute cumulative MOEs (DIBP OES + cumulative non-attributable) were 25 to 27.

4.4.4.1 Overall Confidence in Cumulative Worker Risk Estimates

As described in Section 4.1.1.4 and the *Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate* ([U.S. EPA, 2025t](#)), EPA has moderate confidence in the assessed inhalation and dermal OESs. EPA has robust confidence in the RPFs and index chemical POD used to calculate the RPF analysis and cumulative MOEs (Section 4.4.1.2). To derive RPFs and the index chemical POD, the Agency integrated data from multiple studies evaluating fetal testicular testosterone using a meta-analysis approach and conducted BMD modeling. Finally, the Agency has robust confidence in the non-attributable cumulative exposure estimates for DEHP, DBP, BBP, DIBP, and DINP derived from NHANES urinary biomonitoring data using reverse dosimetry (Section 4.4.2.1). Overall, EPA has moderate confidence in the cumulative risk estimates calculated for worker exposure scenarios (Table 4-22).

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Table 4-22. Risk Summary Table for Female Workers of Reproductive Age Using the RPF Analysis

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute MOEs for Female Workers of Reproductive Age (Benchmark = 30)			
				Inhalation MOE (DIBP COU; Exposure in DBP Equivalents)	Dermal MOE (DIBP COU; Exposure in DBP Equivalents)	Aggregate MOE (DIBP COU; Exposure in DBP Equivalents)	Cumulative MOE (Aggregate DIBP MOE + Cumulative Non-Attributable) ^a
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	HE	1,600	576	421	207
			CT	7,200	1,152	992	289
Manufacturing – Importing	Importing	Repackaging into large and small containers	HE	1,600	576	421	207
Processing – Repackaging	Repackaging (e.g., laboratory chemicals)		CT	7,200	1,152	992	289
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Adhesive manufacturing;	Incorporation into adhesives and sealants	HE	1,600	576	421	207
			CT	7,200	1,152	992	289
Processing – Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	HE	1,600	576	421	207
			CT	7,200	1,152	992	289
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (e.g., catalyst component for polyolefins production)	Formulation into pre-catalyst	HE	1,600	576	421	207
			CT	7,200	1,152	992	289
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Intermediate in polypropylene manufacturing	HE	1,600	576	421	287
			CT	7,200	1,152	992	289

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Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute MOEs for Female Workers of Reproductive Age (Benchmark = 30)			
				Inhalation MOE (DIBP COU; Exposure in DBP Equivalents)	Dermal MOE (DIBP COU; Exposure in DBP Equivalents)	Aggregate MOE (DIBP COU; Exposure in DBP Equivalents)	Cumulative MOE (Aggregate DIBP MOE + Cumulative Non-Attributable) ^a
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Plastic product manufacturing	Plastic compounding	HE	1,400	576	405	203
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings		CT	6,800	1,152	986	288
	Processing aids, not otherwise listed						
Processing – Incorporation into article	Plasticizers in: – Plastic product manufacturing; transportation equipment manufacturing	Plastics converting	HE	78	576	69	59
			CT	1,400	1,152	625	246
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber compounding	HE	28	576	27	25
			CT	290	1,152	230	147
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber converting	HE	30	576	28	27
			CT	570	1,152	383	197

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Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute MOEs for Female Workers of Reproductive Age (Benchmark = 30)			
				Inhalation MOE (DIBP COU; Exposure in DBP Equivalents)	Dermal MOE (DIBP COU; Exposure in DBP Equivalents)	Aggregate MOE (DIBP COU; Exposure in DBP Equivalents)	Cumulative MOE (Aggregate DIBP MOE + Cumulative Non-Attributable) ^a
Industrial use – Paints and coatings	Paints and coatings	Application of paints and coatings – spray application	HE	1.3	576	1.3	1.3
Commercial Use – Paints and coatings	Paints and coatings		CT	85	1,152	79	66
Industrial use – Paints and coatings	Paints and coatings	Application of paints and coatings – non- spray application	HE	1,600	576	421	207
Commercial Use – Paints and coatings	Paints and coatings		CT	7,200	1,152	992	289
Industrial use – Adhesives and sealants	Adhesives and sealants – Two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants – spray application	HE	1.3	576	1.3	1.3
Commercial Use – Adhesives and sealants	Adhesives and sealants – Two-component glues and adhesives		CT	14	1,152	14	13.5
Industrial use – Adhesives and sealants	Adhesives and sealants – Two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants – non-spray application	HE	1,600	576	421	207
Commercial Use – Adhesives and sealants	Adhesives and sealants – Two-component glues and adhesives		CT	7,200	1,152	992	289
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (liquids)	HE	1,600	576	421	207
			CT	7,200	1,152	992	289

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Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute MOEs for Female Workers of Reproductive Age (Benchmark = 30)			
				Inhalation MOE (DIBP COU; Exposure in DBP Equivalents)	Dermal MOE (DIBP COU; Exposure in DBP Equivalents)	Aggregate MOE (DIBP COU; Exposure in DBP Equivalents)	Cumulative MOE (Aggregate DIBP MOE + Cumulative Non-Attributable) ^a
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	HE	11,000	576	546	233
			CT	150,000	1,152	1,143	300
Processing – Recycling	Recycling	Recycling	HE	40	576	37	34
			CT	550	1,152	373	195
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	HE	40	576	37	34
			CT	550	1,152	373	195
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	HE	80	576	70	60
Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)		CT	720	1,152	442	212
Commercial Use – Toys, playground, and sporting equipment	Toys, playground, and sporting equipment						
Industrial Use – Foam	Pipeline pigs	Manufacture of polyurethane foam for pipeline pigs	Assessed using results from the Plastics compounding OES, Plastics converting OES, and Rubber manufacturing OES. See risk estimates above.				

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute MOEs for Female Workers of Reproductive Age (Benchmark = 30)			
				Inhalation MOE (DIBP COU; Exposure in DBP Equivalents)	Dermal MOE (DIBP COU; Exposure in DBP Equivalents)	Aggregate MOE (DIBP COU; Exposure in DBP Equivalents)	Cumulative MOE (Aggregate DIBP MOE + Cumulative Non-Attributable) ^a
^a The acute cumulative MOE is derived by summing inhalation exposure from each individual DIBP COU with dermal exposure from the same DIBP COU and the cumulative non-attributable exposure to DEHP, DBP, BBP, DIBP, and DINP. Non-attributable cumulative exposure was estimated from NHANES urinary biomonitoring data using reverse dosimetry. All exposure estimates were (1) scaled by relative potency, (2) expressed in index chemical equivalents (<i>i.e.</i> , DBP equivalents), (3) summed to calculate cumulative exposure in index chemical equivalents, and then (4) compared to the index chemical POD (<i>i.e.</i> , HED of 2.1 mg/kg-day) to calculate the cumulative MOE.							

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4.4.5 Risk Estimates for Consumers Based on Relative Potency

This section summarizes cumulative risk estimates for consumers from acute duration exposures to DIBP. EPA focused its CRA on females of reproductive age and male infants and children. EPA focused its consumer CRA on these populations for the acute exposure duration because, as described in Section 4.4 and (U.S. EPA, 2025ad), these populations and exposure duration are considered most directly applicable to the common hazard outcome that serves as the basis for the cumulative assessment (*i.e.*, reduced fetal testicular testosterone). For consumers, EPA did not specifically evaluate females of reproductive age or male infants and children; however, consumer exposures of teenagers (16–20 years) and adults (21+ years) were considered a proxy for females of reproductive age, while infants (<1 year), toddlers (1–2 years), children (3–5 and 6–10 years), and young teens (11–15 years) were considered a proxy for male infants and children.

To evaluate cumulative risk to consumers, EPA combined inhalation, dermal, and ingestion exposures to DIBP from each individual consumer COU and product/article exposure scenario with non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP (estimated from NHANES urinary biomonitoring using reverse dosimetry). As described in Section 4.4.3, for each individual phthalate exposures were scaled by relative potency per chemical, expressed in terms of index chemical (DBP) equivalents, and summed to estimate cumulative exposure and cumulative risk for each COU.

As described in Section 4.3.3, EPA evaluated 21 product or article example exposure scenarios associated with 6 consumer COUs. Of the 21 product or article examples, 18 (associated with 6 COUs) have high-intensity cumulative MOEs ranging from 44 to 482 (benchmark = 30; listed below) (Table 4-23). Three product or article examples (associated with 3 COUs) have high- or medium-intensity cumulative MOEs ranging from 14 to 29 (benchmark = 30) (Table 4-23). The three product or article examples (*i.e.*, wood flooring adhesive, clothing (children's), vinyl flooring) with cumulative MOEs less than 30 are discussed further below,

Product or Article Examples with Acute High-Intensity Cumulative MOEs Ranging from 44–482

As can be seen from Table 4-23, cumulative MOEs for high-intensity scenarios ranged from 44 to 482 for all consumer age groups evaluated for 18 out of 21 product or articles examples (associated with 6 COUs), including:

- Construction, paint, electrical, and metal products: Adhesives and sealants, including fillers and putties: Concrete Adhesive (cumulative MOEs: 75–97);
- Fabric, textile, and leather products not covered elsewhere: Clothing (synthetic leather) (cumulative MOEs: 280–309);
- Fabric, textile, and leather products not covered elsewhere: Furniture components (textile) (cumulative MOEs: 44–214);
- Fabric, textile, and leather products not covered elsewhere: Small articles with potential for semi-routine contact: Bags, belts, headband accessories, and steering wheel cover (cumulative MOEs: 164–396);
- Floor coverings: Carpet tiles (cumulative MOEs: 178–434);
- Adhesives and sealants: Adhesives and sealants: Sealants for Small Home Repairs (cumulative MOEs: 75–97)
- Paints and coatings: paints and coatings: Paints (cumulative MOEs: 164–396);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Air beds (cumulative MOEs: 194–482);

- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Car mats (cumulative MOEs: 194–448);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Footwear components (cumulative MOEs: 181–443);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Shower curtains (cumulative MOEs: 190–468);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Small articles with potential for semi-routine contact: Tires and variety PVC articles, bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard (cumulative MOEs: 164–396);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Tire crumb (cumulative MOEs: 179–417);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Wallpaper (in place) (cumulative MOEs: 172–428);
- Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere: Wallpaper (installation) (cumulative MOEs: 300–336);
- Toys, playground, and sporting equipment: Toys, playground, and sporting equipment: Children’s toys (legacy) (cumulative MOEs: 149–380);
- Toys, playground, and sporting equipment: Toys, playground, and sporting equipment: Children’s toys (new) (cumulative MOEs: 168–423); and
- Toys, playground, and sporting equipment: Toys, playground, and sporting equipment: Small Articles with Potential for semi-routine contact: Variety PVC articles, diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs (cumulative MOEs: 164–396).

Product or Article Examples with Acute Cumulative MOEs Ranging from 14–29

As can be seen from Table 4-23, cumulative MOEs for high- and/or medium-intensity scenarios ranged from 14 to 29 for 3 out of 21 product or articles examples (associated with 3 COUs). These include the following:

Adhesives and Sealants: Wood Flooring Adhesives: Acute high-intensity cumulative MOEs were 26 and 27 for infants (<1 year) and toddlers (1–2 years), respectively, and ranged from 32 to 77 for older age groups (benchmark = 30) (Table 4-23). The acute medium-intensity cumulative MOE was 29 for infants (<1 year), and ranged from 30 to 97 for older age groups, while low-intensity cumulative MOEs ranged from 63 to 189 across all age groups (Table 4-23). In the individual DIBP assessment, high-intensity aggregate MOEs were 43 and 45 for infants (<1 year) and toddlers (1–2 years), respectively, and ranged from 56 to 137 for all other age groups (benchmark = 30) (Table 4-18). The wood flooring adhesives exposure scenario from the individual DIBP assessment is characterized further below.

One wood flooring adhesive was identified with DIBP content in the range of 0.025 w/w (weight per weight) to 0.05 w/w ([Jowat Corporation, 2016](#)); these weight fractions were used in the low and high exposure scenarios, and the average value of 0.0375 w/w was used in the medium exposure scenario. This product was assessed for both inhalation and dermal exposure.

For wood flooring adhesive DIY application duration per event for inhalation and duration of skin contact used in the high- and medium-intensity use scenarios were 480 and 240 minutes respectively. For flooring adhesives products, large projects could be a full day of work, while smaller projects may be accomplished more quickly, so duration of use for high, medium, and low exposure scenarios were assumed to be 480 minutes, 240 minutes, and 120 minutes. The contact area for all intensity use exposure scenarios corresponded to 10 percent of hands (some fingers) because the product consistency

is sticky, and users are not expected to immerse their hands in it to spread it and likely use an applicator or squirt product directly on the surface. For flooring adhesives, a single product was identified which was sold in a five gallon can. The high-intensity exposure scenario for this product assumed that the entire mass of the product container is used, reflecting scenarios where a large project or extensive application is undertaken. Medium-intensity exposure scenario assumed half the container's mass was used, representing more common or average usage for routine maintenance or smaller projects. Low-intensity exposure scenarios assumed a quarter of the container's mass was used, corresponding to minimal use for minor repairs or touch-ups. This approach is consistent with observations of consumer reviews for individual products on vendor websites, which indicated diverse usage patterns among consumers including small, medium, and large projects.

For liquid and paste products, it was assumed that contact with the product occurs at the beginning of the period of use and the product is not washed off until use is complete. The duration of dermal contact for wood flooring adhesives is equal to the duration of use applied in CEM modeling. For wood flooring adhesives, EPA used the CEM glue and adhesives (large scale) use durations were used for skin contact duration. The Agency decreased uncertainty by selecting use pattern inputs that represent product use descriptions and furthermore capture the range of possible use patterns in the high to low intensity use scenarios. Exposure and risk estimates are considered representative of product use patterns and well characterized. EPA has a robust confidence in all the use pattern inputs for wood flooring adhesives exposure scenarios.

The main strength of the dermal exposure assessment approach is the incorporation of the empirical *in vitro* human skin absorption data of (Scott et al., 1987) into the assessment to obtain the absorptive flux. Dermal contact with products or formulations that have low concentrations of DIBP may exhibit lower rates of flux since there is less material available for absorption. Conversely, co-formulants or materials within the products or formulations may lead to enhanced dermal absorption, even at lower concentrations. Therefore, it is uncertain whether the products or formulations containing DIBP would result in decreased or increased dermal absorption. Based on the reasonably available dermal absorption data for DIBP, EPA has made assumptions that result in exposure assessments that are human health protective. EPA has high confidence in the other input parameters used in the consumer dermal exposure assessment such as frequency of use, duration of use, and surface area. Based on the available *in vitro* dermal absorption data for DBP, which is used as a surrogate for DIBP due to chemical similarities, there is moderate confidence in the estimated rate of absorption from liquid materials containing DIBP.

Fabric, Textile, and Leather Products Not Covered Elsewhere: Clothing (Children's): Acute high-intensity cumulative MOEs ranged from 24 to 29 for infants (<1 year), toddlers (1–2 years), and preschoolers (3–5 years), and ranged from 36 to 46 for older age groups (benchmark = 30) (Table 4-23). Acute medium-intensity cumulative MOEs ranged from 91 to 309 across all evaluated age groups. In the individual DIBP assessment, high-intensity dermal MOEs ranged from 40 to 73 across all evaluated age groups (benchmark = 30) (Table 4-18).

The acute dermal, high-intensity exposure scenario MOEs for children's clothing range from 40 to 73 for infants to teenagers. The acute and chronic dermal, medium-intensity use MOEs for children's clothing range from 250 to 1,200 for infants to teenagers. For children's clothing the duration of skin contact used in the high- and medium-intensity use scenarios were 480 and 240 minutes respectively, to consider changes of clothing appropriate for young children. The contact area for the high-intensity use scenario corresponded to 50 percent of entire body surface area and 25 percent of face, hands, and arms for the medium-intensity use scenario.

For articles for which default input values for duration of use are not available in CEM or the *Exposures Factors Handbook*, professional judgement was used to select the duration of use and article contact for the low, medium, and high exposure scenario levels. Clothing uses have the potential for long durations of dermal contact but may be also used for shorter periods and were thus modeled at 480, 240, and 120 minutes. The identified children's clothing items containing DIBP included tops, bottoms, and underwear, which are likely to be used for 8 hours (480 minutes in the high-intensity use scenarios) or more, but also for shorter periods represented in the medium-intensity use scenario. While the children's clothing examples can be used for longer periods than 8 hours, any increases in skin contact for the 50 percent of entire body surface area, high-intensity use scenario will result in smaller MOEs than the already captured. The medium-intensity use scenario for children's clothing considers 25 percent of face, hands, and arms surface in contact with the clothing item and for 4 hours total. The medium-intensity use children's clothing scenario represent clothing items similar to raincoats and accessories. EPA has a robust confidence that the high- and medium-intensity use scenario inputs accurately represent expected uses.

There is uncertainty with respect to the modeling of dermal absorption of DIBP from solid matrices or articles. EPA has assumed that dermal absorption of DIBP from solid objects would be limited by aqueous solubility of DIBP. The selected absorptive flux is most representative of dermal absorption to DIBP from liquid compounds. Since it is expected that absorption of DIBP from solid materials will not exceed the rate of absorption of DIBP from liquid materials, the dermal exposure estimates represent the expected levels of consumer dermal exposure for contact with liquid materials and upper bound estimates for contact with solid materials. There is some uncertainty based on the assumption of migration from solid to aqueous media to skin. EPA has a slight to moderate confidence in the dermal exposure to solid products or articles modeling approach.

Floor Coverings: Vinyl Flooring: Acute high-intensity cumulative MOEs ranged from 14 to 26 for infants (<1 year), toddlers (1–2 years), preschoolers (3–5 years), and middle-aged children (6–10 years), and ranged from 38 to 53 for all other age groups (benchmark = 30) (Table 4-23). Acute medium-intensity cumulative MOEs ranged from 60 to 187 across all evaluated age groups. In the individual DIBP assessment, high-intensity aggregate MOEs ranged from 22 to 27 (benchmark = 30) for infants (<1 year), toddlers (1–2 years), and preschoolers (3–5 years), and ranged from 41 to 88 for all other age groups (Table 4-18). The vinyl flooring exposure scenario from the individual DIBP assessment was characterized in detail previously in Section 4.3.3.

Factors Contributing to Lower Cumulative MOEs Compared to MOEs in the Individual DIBP Assessment

EPA characterizes the preceding 6 consumer COUs and 21 product or article examples as part of the individual DIBP assessment in Section 4.3.3. Three factors contribute to the lower cumulative MOEs compared to the MOEs in the individual DIBP consumer risk assessment, including:

- *Scaling by Relative Potency:* DIBP inhalation, dermal, and ingestion exposures for each product or article example were scaled by relative potency to the index chemical. The RPF for DIBP is 0.53 (Table 4-19), which means DIBP exposures when multiplied by the RPF and expressed in terms of index chemical (DBP) equivalents, decreased by 47 percent. As discussed previously in Section 4.4.4, EPA has robust confidence in the draft RPFs used in this CRA (Section 4.4.1).
- *Index Chemical POD:* As described previously in Sections 4.4.1, 4.4.3, and 4.4.4, cumulative MOEs are calculated by dividing the cumulative exposure estimate expressed in terms of index chemical (DBP) equivalents by the index chemical POD. The POD for the index chemical (DBP) used to calculate cumulative risk is 2.1 mg/kg (based on a BMDL₅ for reduced fetal testicular

testosterone). Comparatively, the DIBP POD used to calculate MOEs for individual DIBP COUs in Section 4.3.2 is 5.7 mg/kg (based on a BMDL₅ for reduced fetal testicular testosterone). *The index chemical (DBP) POD is approximately 2.7-fold lower (i.e., more sensitive) than the individual DIBP POD, which is the primary factor leading to lower cumulative MOEs.* Overall, EPA has robust confidence in the index chemical (DBP) POD used in this CRA (see Sections 4.4.1 and 4.4.4 for further discussion).

- *Addition of Non-Attributable Cumulative Exposure:* As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data from the 2017 to 2018 survey (most recent dataset available) and reverse dosimetry (see Section 4.4.2 and ([U.S. EPA, 2025ad](#)) for further details), representing exposure to a national population. Non-attributable cumulative exposure estimates were scaled by relative potency and expressed in index chemical (DBP) equivalents. Non-attributable cumulative exposure was then combined with acute inhalation, dermal, and ingestion DIBP exposures for each individual product or article example exposure scenario scaled by relative potency. For infants, toddlers, and preschoolers, EPA added a non-attributable cumulative exposure of 10.8 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 15.5 percent to the risk cup with a benchmark MOE of 30. For middle-aged children, EPA added a non-attributable cumulative exposure of 7.35 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 10.5 percent to the risk cup with a benchmark MOE of 30. For young teens (11–15 years), EPA added a non-attributable cumulative exposure of 4.36 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 6.2 percent to the risk cup with a benchmark MOE of 30. For teenagers (16–20 years) and adults (21+ years), EPA added a non-attributable cumulative exposure of 5.15 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 7.4 percent to the risk cup with a benchmark MOE of 30. Overall, EPA has robust confidence in the non-attributable cumulative exposure estimate since it was calculated from CDC’s NHANES biomonitoring dataset, which provides a statistically representative sampling of the U.S. civilian population. Furthermore, the Agency used a well-established reverse dosimetry approach to calculate phthalate daily intake values from urinary biomonitoring data.

4.4.5.1 Overall Confidence in Cumulative Consumer Risks

As described in Section 4.1.2.4 and in more technical details in the *Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)), EPA has moderate and robust confidence in the assessed inhalation, ingestion, and dermal consumer exposure scenarios. The Agency has robust confidence in the RPFs and index chemical POD used to calculate the cumulative MOEs (Section 4.4.1.2). To derive RPFs and the index chemical POD, EPA integrated data from multiple studies evaluating fetal testicular testosterone using a meta-analysis approach and conducted BMD modeling. Finally, EPA has robust confidence in the non-attributable cumulative exposure estimates for DEHP, DBP, BBP, DIBP, and DINP derived from NHANES urinary biomonitoring data using reverse dosimetry (Section 4.4.2.1). Overall, EPA has moderate to robust confidence in the cumulative risk estimates calculated for consumer exposure scenarios (Table 4-23).

3707 **Table 4-23. Consumer Cumulative Risk Summary Table**

Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) ^a	Exposure Scenario	Lifestage (Years) MOE (Based on All Exposures in Index Chemical Equivalents) (Benchmark MOE = 30)						
				Infant (<1 year)	Toddler (1–2 years)	Preschooler (3–5 years)	Middle Childhood (6–10 years)	Young Teen (11–15 years)	Teenager (16–20 years)	Adult (21+ years)
Consumer Uses: Construction, paint, electrical, and metal products: Adhesives and sealants, including fillers and putties	Concrete adhesive	H	Cumulative (Aggregate DIBP COU + Cumulative Non-Attributable)	–	–	–	–	471	400	400
	Wood flooring adhesive	H	Dermal (COU alone)	–	–	–	–	5582	6104	5712
			Ingestion (COU alone)	–	–	–	–	–	–	–
			Inhalation (COU alone)	30 ^d	31 ^d	39 ^d	49 ^d	66	83	97
			Aggregate (COU alone)	–	–	–	–	65	82	95
			Cumulative (NHANES)	194	194	194	286	482	407	407
			Cumulative (Aggregate COU + Cumulative NHANES)	26 ^b	27 ^b	32	42	57	68	77
		M	Dermal (COU alone)	–	–	–	–	11,164	12,207	11,423
			Ingestion (COU alone)	–	–	–	–	–	–	–
			Inhalation (COU alone)	34 ^d	36 ^d	44 ^d	62 ^d	88	105	129
			Aggregate (COU alone)	–	–	–	–	88	104	127
			Cumulative (NHANES)	194	194	194	286	482	407	407
			Cumulative (Aggregate COU + Cumulative NHANES)	29 ^b	30	36	51	74	83	97
		L	Dermal (COU alone)	–	–	–	–	22,327	24,415	22,847
			Ingestion (COU alone)	–	–	–	–	–	–	–
			Inhalation (COU alone)	94 ^d	100 ^d	122 ^d	175 ^d	247	290	359
			Aggregate (COU alone)	–	–	–	–	244	286	354
			Cumulative (NHANES)	194	194	194	286	482	407	407
			Cumulative (Aggregate COU + Cumulative NHANES)	63	66	75	108	162	168	189
	Sealants for small home repairs	H	Cumulative (Aggregate COU + Cumulative NHANES)	36	38	45	65	75	85	97

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Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) ^a	Exposure Scenario	Lifestage (Years) MOE (Based on All Exposures in Index Chemical Equivalents) (Benchmark MOE = 30)						
				Infant (<1 year)	Toddler (1–2 years)	Preschooler (3–5 years)	Middle Childhood (6–10 years)	Young Teen (11–15 years)	Teenager (16–20 years)	Adult (21+ years)
Consumer Uses: Fabric, textile, and leather products not covered elsewhere: Fabric, textile, and leather products not covered elsewhere (e.g., textile [fabric] dyes)	Clothing (children's)	H	Dermal (COU alone)	28	31	35	42	51	–	–
			Ingestion (COU alone)	–	–	–	–	–	–	–
			Inhalation (COU alone)	–	–	–	–	–	–	–
			Aggregate (COU alone)	–	–	–	–	–	–	–
			Cumulative (NHANES)	194	194	194	286	482	–	–
			Cumulative (Dermal COU + Cumulative NHANES)	24	27	29	36	46	–	–
		M	Dermal (COU alone)	173	404	516	672	864	–	–
			Ingestion (COU alone)	–	–	–	–	–	–	–
			Inhalation (COU alone)	–	–	–	–	–	–	–
			Aggregate (COU alone)	–	–	–	–	–	–	–
			Cumulative (NHANES)	194	194	194	286	482	–	–
			Cumulative (Dermal COU + Cumulative NHANES)	91	131	141	200	309	–	–
	Clothing (synthetic leather)	H	Cumulative (Dermal COU + Cumulative NHANES)	– ^e	– ^e	– ^e	– ^e	– ^e	– ^e	– ^e
		M	Cumulative (Dermal COU + Cumulative NHANES)	–	–	–	–	309	285	280
	Furniture components (textile)	H	Cumulative (Aggregate COU + Cumulative NHANES)	134	136	144	214	44	47	49
	Small articles with potential for semi-routine contact: bags, belts, headband accessories, and steering wheel cover	H	Cumulative (Aggregate COU + Cumulative Non-Attributable)	164	168	171	246	396	349	345

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Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) ^a	Exposure Scenario	Lifestage (Years) MOE (Based on All Exposures in Index Chemical Equivalents) (Benchmark MOE = 30)						
				Infant (<1 year)	Toddler (1–2 years)	Preschooler (3–5 years)	Middle Childhood (6–10 years)	Young Teen (11–15 years)	Teenager (16–20 years)	Adult (21+ years)
Consumer Uses: Floor coverings: floor coverings	Carpet tiles	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	178	180	182	264	434	375	373
	Vinyl flooring	H	Dermal (COU alone)	4,206	4,919	5,691	7,059	8,931	9,766	9,139
			Ingestion (COU alone)	192	155	137	391	698	880	1,966
			Inhalation (COU alone)	16	17	21	31	44	51	64
			Aggregate (COU alone)	15	16	19	28	41	48	61
			Cumulative (NHANES)	194	194	194	286	482	407	407
			Cumulative (Aggregate COU + Cumulative NHANES)	14 ^c	14 ^c	17 ^c	26 ^b	38	43	53
		M	Dermal (COU alone)	8412	9837	11,382	14,118	17,862	19,532	18,277
			Ingestion (COU alone)	1,100	889	787	2,242	4,005	5,049	11,280
			Inhalation (COU alone)	94	100	123	177	251	293	365
			Aggregate (COU alone)	86	89	106	162	233	273	347
			Cumulative (NHANES)	194	194	194	286	482	407	407
			Cumulative (Aggregate COU + Cumulative NHANES)	60	61	68	104	157	164	187
Consumer Uses: Paints and coatings: paints and coatings	Paints	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	164	168	171	246	396	349	345

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Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) ^a	Exposure Scenario	Lifestage (Years) MOE (Based on All Exposures in Index Chemical Equivalents) (Benchmark MOE = 30)						
				Infant (<1 year)	Toddler (1–2 years)	Preschooler (3–5 years)	Middle Childhood (6–10 years)	Young Teen (11–15 years)	Teenager (16–20 years)	Adult (21+ years)
Consumer Uses: Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere	Air beds	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	194	194	194	286	482	407	407
	Car mats	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	194	194	194	286	448	385	383
	Footwear components	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	181	183	184	268	443	382	380
	Shower curtains	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	190	190	191	280	468	398	398
	Small articles with potential for semi- routine contact: tires and variety PVC articles, bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	164	168	171	246	396	349	345
	Tire crumbs	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	–	–	179	256	417	365	364
	Wallpaper (in place)	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	172	173	176	259	428	373	386
	Wallpaper (installation)	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	–	–	–	–	336	305	300

Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) ^a	Exposure Scenario	Lifestage (Years) MOE (Based on All Exposures in Index Chemical Equivalents) (Benchmark MOE = 30)						
				Infant (<1 year)	Toddler (1–2 years)	Preschooler (3–5 years)	Middle Childhood (6–10 years)	Young Teen (11–15 years)	Teenager (16–20 years)	Adult (21+ years)
Consumer Uses: Toys, playground, and sporting equipment: Toys, playground, and sporting equipment	Children's toys (legacy)	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	149	155	161	235	380	339	376
	Children's toys (new)	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	168	174	177	259	423	368	404
	Small articles with potential for semi- routine contact: variety PVC articles, diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	164	168	171	246	396	349	345
	Tire crumb	H	Cumulative (Aggregate COU + Cumulative Non- Attributable)	—	—	192	281	471	400	400
^a Exposure scenario intensities include high (H), medium (M), and low (L). ^b MOEs for this age group <30 in the cumulative assessment, but not the individual DIBP risk assessment. ^c MOEs for this age group <30 in both the cumulative and individual DIBP risk assessment. ^d MOE for bystander scenario. ^e Scenario was deemed to be unlikely due to high uncertainties, see <i>Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025d).										

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4.4.6 Cumulative Risk Estimates for the General Population

For DIBP, EPA did not evaluate cumulative risk for the general population from environmental releases. As discussed in Section 4.1.3, the Agency employed a screening level approach to assess risk from exposure to DIBP for the general population from environmental releases. Using this conservative screening level approach, EPA did not identify any pathways of concern, indicating that refinement was not necessary. However, as discussed in Section 4.4.2, EPA did evaluate cumulative exposure and risk from exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data. The NHANES biomonitoring dataset is a national, statistical representation of the general, non-institutionalized, civilian U.S. population and provides estimates of average aggregate exposure to individual phthalates for the U.S. population. As can be seen from Table 4-20, and as discussed in more detail in the *Revised Draft Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* ([U.S. EPA, 2025ad](#)), 95th percentile cumulative MOEs ranged from 194 to 592 (cumulative benchmark = 30) for females of reproductive age and male children. These MOEs indicate that the risk cup is 6.2 to 15.5 percent full and indicate that cumulative exposure to DEHP, DBP, DIBP, BBP, and DINP, based on the most recent NHANES survey data (2017 to 2018), does not currently pose a risk to most male children or pregnant women within the U.S. civilian population.

4.5 Comparison of Single Chemical and Cumulative Risk Assessments

In support of the developed CRA, EPA has relied substantially on existing CRA-related work by the Agency's Risk Assessment Forum (RAF), EPA Office of Pesticide Programs (OPP), the Organisation for Economic Co-operation and Development (OECD), the European Commission, and the World Health Organization (WHO) and International Programme on Chemical Safety (IPCS), including:

- *Guidelines for the Health Risk Assessment of Chemical Mixtures* ([U.S. EPA, 1986](#));
- *Guidance for Identifying Pesticide Chemicals and Other Substances that Have a Common Mechanism of Toxicity* ([U.S. EPA, 1999](#));
- *Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures* ([U.S. EPA, 2000](#));
- *General Principles for Performing Aggregate Exposure and Risk Assessments* ([U.S. EPA, 2001](#));
- *Guidance on Cumulative Risk Assessment of Pesticide Chemicals that Have a Common Mechanism of Toxicity* ([U.S. EPA, 2002a](#));
- *Framework for Cumulative Risk Assessment* ([U.S. EPA, 2003](#));
- *Concepts, Methods and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures, and Effects: A Resource Document* ([U.S. EPA, 2007a](#));
- *Pesticide Cumulative Risk Assessment: Framework for Screening Analysis Purpose* ([U.S. EPA, 2016b](#));
- *Advances in Dose Addition For Chemical Mixtures: A White Paper* ([U.S. EPA, 2023a](#)).
- *Phthalates and Cumulative Risk Assessment: The Tasks Ahead* ([NRC, 2008](#));
- *State of the Art Report on Mixture Toxicity* ([Kortenkamp et al., 2009](#));
- *Risk Assessment of Combined Exposure to Multiple Chemicals: A WHO/IPCS Framework* ([Meek et al., 2011](#)); and
- *Considerations for Assessing the Risks of Combined Exposure to Multiple Chemicals* ([OECD, 2018](#)).

Herein, EPA has evaluated risks for workers (Section 4.3.2), consumers (Section 4.3.3), and the general population (Section 4.3.4) from exposure to DIBP alone, as well as cumulative risks for workers (Section 4.4.4) and consumers (Section 4.4.5) that take into account differences in relative potency and

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cumulative non-attributable exposure to DEHP, DBP, BBP, DIBP, and DINP from NHANES biomonitoring and reverse dosimetry.

There are several notable differences between the individual DIBP assessment (Section 4.3) and the CRA (Section 4.4). As part of the individual DIBP assessment (Section 4.3), EPA considered all human health hazards of DIBP and selected a POD based on a BMDL₅ for reduced fetal testicular testosterone to characterize risk from exposure to DIBP. As part of its exposure assessment in the individual DIBP assessment, EPA considered acute, intermediate, and chronic exposures durations for a broad range of populations—including female workers of reproductive age, average adult workers, ONUs, the general population, and consumers of various lifestages (*e.g.*, infants, toddlers, children, adults). Furthermore, in the individual DIBP assessment, EPA evaluated inhalation and dermal exposures to workers, as well as consumer exposure to DIBP via the inhalation, dermal, and ingestion exposure routes. In contrast, the CRA is more focused in scope (Section 4.4). First, the CRA is based on a uniform measure of hazard (*i.e.*, reduced fetal testicular testosterone) that serves as the basis for deriving RPFs and the index chemical (DBP) POD, which were derived via meta-analysis and BMD modeling (Section 4.4.1). Second, the CRA is focused on acute duration exposures and the most sensitive populations (*i.e.*, females of reproductive age, male infants, male children) (Section 4.4). Finally, for the CRA, DIBP exposures from individual consumer and worker COUs were (1) scaled by relative potency; (2) expressed in index chemical (DBP) equivalents; and (3) combined with non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP from NHANES.

Both the individual DIBP assessment (Section 4.3) and the CRA (Section 4.4) led to similar conclusions regarding risk estimates for workers and consumers. For workers, cumulative acute high-end MOEs were less than 30 for only 2 OES that did not already have an MOE less than 30 in the individual DIBP assessment (*i.e.*, high-end cumulative MOE = 27 for Rubber converting OES and 25 for Rubber compounding) (Section 4.4.4). Comparatively, for the Rubber converting and Rubber compounding OESs, the high-end aggregate MOEs were 41 and 39, respectively, in the individual DIBP assessment. For consumers, high-intensity acute aggregate MOEs in the individual DIBP assessment (Section 4.3.3) and high-intensity acute cumulative MOEs were less than 30 for 1 of 21 product and article examples (*i.e.*, vinyl flooring), while an additional two product and article examples (*i.e.*, wood flooring adhesive, clothing (children's)) had only high- and/or medium-intensity cumulative MOEs less than 30. Overall, there are three factors that influenced differences in risk estimates between the individual DIBP assessment (Section 4.3) and the RPF analysis (Section 4.4), which are described below:

- **Scaling by Relative Potency.** DIBP inhalation, dermal, and ingestion exposures from individual COUs were scaled by relative potency to the index chemical. The RPF for DIBP is 0.53, which means DIBP exposures when multiplied by the RPF and expressed in terms of index chemical (DBP) equivalents, decreased by 47 percent.
- **Index Chemical POD.** Cumulative MOEs are calculated by dividing the index chemical POD by a cumulative exposure estimate expressed in terms of index chemical (DBP) equivalents. The POD for the index chemical (DBP) used to calculate cumulative risk is 2.1 mg/kg (based on a BMDL₅ for reduced fetal testicular testosterone). Comparatively, the DIBP POD used to calculate MOEs for individual DIBP COUs is 5.7 mg/kg (based on a BMDL₅ for reduced fetal testicular testosterone). The index chemical (DBP) POD is approximately 2.7-fold lower (*i.e.*, more sensitive) than the individual DIBP POD, which contributes to the lower cumulative MOEs.
- **Addition of Non-Attributable Cumulative Exposure.** As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary

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biomonitoring data from the 2017 to 2018 survey reverse dosimetry (Section 4.4.2), representing exposure to a national population. *Overall, this non-attributable cumulative exposure contributes approximately 6.2 to 15.5 percent to the risk cup, depending on the population and age group.*

Ultimately, the impact of scaling by relative potency and using the index chemical POD to calculate the cumulative MOE has a significant impact on the risk estimates for exposure to DIBP alone. There is little additional cumulative risk by adding the simultaneous exposure of other phthalates to the single chemical risk estimates for DIBP (*i.e.*, non-attributable cumulative exposure from NHANES adds 6.2–15.5% to the risk cup).

EPA has robust confidence in its CRA and moderate to robust confidence in its individual assessment of DIBP for workers (Section 4.3.2.1), consumers (Section 4.3.3.1), and the general population (Section 4.1.3.3). RPFs used to scale for relative potency were calculated based on a common hazard endpoint (*i.e.*, reduced fetal testicular testosterone) from data from multiple studies evaluating effects of phthalates on fetal testicular testosterone using a meta-analysis and BMD modeling approach for each of the six phthalates included in the cumulative chemical group ([U.S. EPA, 2025ad](#)). This analysis provides a robust basis for assessing the dose-response for the common hazard endpoint (*i.e.*, reduced fetal testicular testosterone) across the six toxicologically similar phthalates included in the CRA.

3818 **5 ENVIRONMENTAL RISK ASSESSMENT****DIBP – Environmental Risk Assessment (Section 5):
Key Points**

EPA considered all reasonably available information identified through the systematic review process under TSCA to characterize environmental risk for DIBP. The following bullets summarize the key points.

- Aquatic species
 - No risk quotients (RQs) exceeding 1 were calculated for acute exposures to DIBP in aquatic species (vertebrates, invertebrates, and benthic invertebrates) from release to water.
 - RQs exceeding 1 were calculated for chronic aquatic vertebrates.
 - From the highest release OES, Processing/Plastic compounding, an RQ of 2.73 was calculated for high-end medium flow P75 with wastewater removal treatment, which was the scenario selected as most representative of anticipated exposures.
 - For the second highest release OES, Manufacturing/Use as a catalyst, modelled generic scenario concentration at P75 flow, high-end release, without wastewater treatment were comparable to actual facility release data. The RQ for aquatic vertebrates at this COU/OES was 4.21.
 - RQs exceeding 1 were calculated for chronic aquatic invertebrates in screening level analysis, which were below 1 when more realistic flows and wastewater treatments were considered.
 - RQs exceeding 1 were calculated for algae in screening level analysis, which were below 1 when more realistic flows and wastewater treatments were considered.
- Terrestrial species
 - No RQs exceeding 1 were calculated for exposures to DIBP in terrestrial invertebrates or plants from air deposition to soil.
 - No risk was identified for exposures to DIBP in terrestrial mammals through trophic transfer.
- EPA has slight to moderate or moderate confidence in risk estimates with multimedia releases. EPA has robust overall confidence in all other environmental risk assessment conclusions.

5.1 Summary of Environmental Exposures

EPA assessed environmental concentrations of DIBP in air, water, and land for use in environmental exposure. The environmental exposures are described in the *Draft Fate Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025z](#)) and the *Draft Environmental Media and General Population and Environmental Exposure for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)). DIBP is expected to be released to the environment via air, water, biosolids, and landfills. It is expected to show strong affinity and sorption potential in organic carbon in soil and sediment and when released to air, DIBP is expected to adsorb to particulate matter, which will mostly partition to soil and water.

EPA conducted modeling with VVWM-PSC ([U.S. EPA, 2019d](#)) to estimate concentrations of DIBP within surface water and sediment. The Plastic compounding OES resulted in the highest estimated release in the water column in low flow (P50) 7Q10 conditions.

There are uncertainties in the relevance of limited monitoring data for biosolids and landfill leachate to the COUs considered for DIBP ([U.S. EPA, 2025s](#)). However, based on high-quality physical and chemical property data, EPA determined that DIBP will have low persistence potential in soils. Therefore, groundwater concentrations resulting from releases to the landfill or to agricultural lands via biosolids applications were not quantified but are discussed qualitatively. There are limited measured data on concentrations of DIBP in biosolids or soils receiving biosolids and uncertainty that concentrations used in this analysis are representative of all types of environmental releases. Based on the water solubility (6.2 mg/L) and hydrophobicity ($\log K_{OW} = 4.34$; $\log K_{OC} = 2.67$) of DIBP, it is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms. Therefore, DIBP has low potential for trophic transfer through food webs.

5.2 Summary of Environmental Hazards

EPA evaluated the reasonably available information for environmental hazard endpoints associated with DIBP exposure to ecological receptors in aquatic and terrestrial ecosystems. Due to limited environmental hazard data for DIBP, dibutyl phthalate (DBP) was used as an analog and a read-across was conducted to fill data gaps ([U.S. EPA, 2024a](#)). These hazards are described in the *Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025q](#)). For more information on the selection of an analog for DIBP, see Appendix A of the *Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025q](#)).

The acute aquatic concentration of concern (COC) for DIBP was derived from a species sensitivity distribution (SSD), which contained empirical 96-hour LC50s for 9 species identified in systematic review as well as an additional 72 species with predicted LC50 and EC50 values from the Web-based Interspecies Correlation Estimation (Web-ICE) (v4.0) toxicity value estimation tool ([Raimondo, 2010](#)). The SSD was developed using the SSD Toolbox (v1.1), which is an EPA resource that can fit SSDs to environmental hazard data ([Etterson, 2020](#)). Of the nine studies identified in systematic review and used in the SSD, two studies were from the DIBP empirical dataset and seven were from the DBP empirical dataset. The acute COC for aquatic vertebrates, invertebrates, and benthic invertebrates was 287 $\mu\text{g/L}$. All chronic aquatic COCs were calculated using read-across from DBP. The chronic aquatic vertebrate COC was 1.56 $\mu\text{g/L}$, the chronic aquatic invertebrate COC was 12.23 $\mu\text{g/L}$, the chronic aquatic benthic invertebrate COC was 114.3 mg/kg dry sediment, and the algae COC was 31.6 $\mu\text{g/L}$.

For terrestrial species, wildlife mammalian hazard data were not reasonably available; therefore, ecologically relevant reproductive endpoints from laboratory rodent studies were used to derive a hazard value for terrestrial mammals. Empirical DIBP toxicity data for rats were used to estimate a hazard value for terrestrial mammals at 353 mg/kg-bw/day. The terrestrial invertebrate hazard threshold for DIBP was 14 mg DBP/kg dry soil based on read-across from DBP while the terrestrial plant hazard threshold for DIBP was 10 mg DBP/kg dry soil based on a read-across from DBP ([U.S. EPA, 2024a](#)).

5.3 Environmental Risk Characterization

5.3.1 Risk Assessment Approach

The environmental risk characterization of DIBP was conducted to evaluate whether the potential releases and resultant exposures of DIBP in water, sediment, or soil will exceed the DIBP concentrations that result in hazardous effects to aquatic or terrestrial organisms. In evaluating the DIBP exposure concentrations, modeled DIBP concentrations in surface water were used to calculate risk quotients quantitatively. Additionally, modeled air deposition to soil was assessed quantitatively. Because land concentrations of DIBP in biosolids and landfills as well as in air are limited or not expected to be bioavailable, they were discussed qualitatively. In evaluating the environmental hazard of DIBP, a

weight of evidence approach was used to select hazard threshold concentrations for the derivation of RQs for aquatic organisms. A weight of evidence approach was also used to select hazard threshold concentrations for a description of risk of DIBP for terrestrial organisms.

Environmental risk was characterized by calculating RQs ([U.S. EPA, 1998](#); [Barnthouse et al., 1982](#)). The RQ is defined in Equation 5-1 as follows:

Equation 5-1. Calculating the Risk Quotient

$$RQ = \frac{\text{Predicted Environmental Concentration}}{\text{Hazard Threshold}}$$

For aquatic organisms, the “effect level” is a derived COC based on a hazard effects concentration. The COC used to calculate RQs for aquatic organisms was derived from hazard values resulting from acute and chronic exposures to DIBP (or analog DBP). An RQ equal to 1 indicates that the exposures are the same as the concentration that causes effects. If the RQ is above 1, the exposure is greater than the effect concentration and risk is indicated. If the RQ is below 1, the exposure is less than the effect concentration and risk is not indicated.

Environmental monitoring and biomonitoring data were reviewed and screened to assess wildlife exposure to DIBP ([U.S. EPA, 2025s](#)). EPA conducted a trophic transfer assessment by evaluating the chemical and physical properties, fate, and exposure of DIBP and determined that DIBP does not bioaccumulate. Due to its physical and chemical properties, environmental fate, and exposure parameters, DIBP is not expected to persist in surface water, groundwater, or air. Additionally, because DIBP has low bioaccumulation and biomagnification potential in aquatic and terrestrial organisms, it is expected to go through trophic dilution as it passes through food webs.

5.3.2 Risk Characterization for Aquatic Receptors

Releases of DIBP to water with subsequent exposure in surface water sediments were identified for 14 OESs (Table 3-6). Risk to aquatic organisms was characterized by comparing hazard thresholds (COCs) to modeled surface water exposures from water releases. Risk to aquatic benthic organisms was characterized by comparing COCs to modeled benthic sediment concentrations resulting from water releases. For the purposes of risk screening, the upper-bound surface water concentration was the DIBP limit of water solubility (6.2 mg/L) ([U.S. EPA, 2024f](#)). Surface water concentrations from high-end and central tendency releases for P50 7Q10 flows (36,950 m³/day; 15 ft³/sec), P75 7Q10 flows (634,500 m³/day; 259 ft³/sec), P90 7Q10 flows (10,740,000 m³/day; 4390 ft³/sec) flows were modeled and used to derive RQ values.

For each OES, EPA conducted modeling with VVWM-PSC ([U.S. EPA, 2019d](#)) to estimate concentrations of DIBP within surface water. The 7Q10 P50 flow distribution includes the maximum modeled surface water concentrations, which likely overestimates modeled concentrations. EPA considers flows from the upper percentiles of the generic distribution (*i.e.*, P75 or P90) to be more appropriately paired with the high-end release estimates ([U.S. EPA, 2025s](#)). For eight OESs, the type of discharge (Table 3-6) indicated wastewater to on-site treatment or discharge to POTW; thus, RQs for these were calculated with an applied 68 percent wastewater removal treatment ([U.S. EPA, 1982](#)). Of these eight, four OESs also had information that indicated the type of discharge as possibly direct to surface water; therefore, RQs for these OESs were also calculated without wastewater removal treatment applied. Whether the surface water concentration is based on wastewater treatment or direct release is an assumption of two possible scenarios within the modelled values, without direct evidence of one being

more likely than the other. Therefore, for those four OESs in which the type of discharge indicated either on-site treatment or discharge to POTW or direct to surface water, RQs were calculated for both scenarios. For the remaining six OESs, the modeled generic scenarios did not distinguish the amount or type of discharge (*i.e.*, landfill, incineration, surface water, or combination) therefore, other lines of evidence were evaluated for each of these OESs individually to better inform the modeled surface water concentrations.

For three OESs (Use as a catalyst – intermediate in polypropylene manufacturing, Application of adhesives and sealants, and Use of laboratory chemicals – solids) under conservative assumptions including no wastewater treatment and 100 percent release to surface water, there were no RQs exceeding 1. Therefore, risk is not expected to aquatic species for these OESs. In the absence of reasonable release data for the Repackaging OES, actual release data from DBP (an analog of DIBP) was used as a comparison ([U.S. EPA, 2025r](#)). Information regarding DBP as an analog to DIBP can be found in Appendix A of the These hazards are described in the *Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025q](#)). Measured DBP concentrations for this OES were significantly lower than modeled concentrations for DIBP. Using actual surface water release data from DBP in place of modeled concentrations for DIBP, no RQs exceeding 1 were found at any flow metric. For the Application of paints and coatings OES, evidence supports the use of wastewater treatment removal. With the application of wastewater treatment, there were no RQs exceeding 1. EPA does not expect risk to aquatic species for these OESs. For the Use as a catalyst – formulation into pre-catalyst OES, existing facility release data supports the modeled P75 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release. Thus, RQs were calculated for this OES based on the 7Q10 high-end P75 release without wastewater treatment (Table 5-3). For the remaining OESs without a specified type of discharge (*i.e.*, landfill, incineration, surface water, or combination), Use as laboratory chemicals – liquid, no facility specific data was available for DIBP nor for DBP. Therefore, EPA has slight confidence in the calculated RQs for these OES. All COUs and a description of whether RQs exceeding 1 can be found in Table 5-1 and Table 5-2. Further description of all COUs where RQs exceeded 1 can be found in Table 5-3.

Table 5-1. Environmental Risk Summary and Basis for Risk Characterization

Life Cycle Stage – Category	Subcategory	OES	RQs >1
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Plastic product manufacturing	Plastic compounding	Yes
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings		
	Processing aids, not otherwise listed		
Processing – Incorporation into article	Plasticizers in: – Plastic product manufacturing; transportation equipment manufacturing	Plastic converting	Yes
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plasticizers in: – Adhesive manufacturing	Incorporation into adhesives and sealants	Yes
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – Plastic material and resin manufacturing; Paints and coatings	Incorporation into paints and coatings	Yes

Life Cycle Stage – Category	Subcategory	OES	RQs >1
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – compounding	Yes
Processing – Processing – Incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – converting	Yes
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	No
Processing – Recycling	Recycling	Recycling	No
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (<i>e.g.</i> , catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst	Yes
Manufacturing – Importing	Importing	Repackaging into large and small containers	No
Processing – Repackaging	Repackaging (<i>e.g.</i> , laboratory chemicals)		
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing	No
Industrial use – Adhesives and sealants	Adhesives and sealants –Two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants	No
Commercial Use – Adhesives and sealants	Adhesives and sealants –Two-component glues and adhesives		
Industrial use – Paints and coatings	Paints and coatings	Application of paints and coatings	No
Commercial Use – Paints and coatings	Paints and coatings		
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals – solids and liquids	Yes ^a
^a COU/OES in which there is slight confidence in calculated RQs. See Section 5.3.4.			

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Table 5-2. Relevant Exposure Pathway to Receptors and Corresponding Risk Assessment for the DIBP Environmental Risk Characterization

Exposure Pathway	Receptor	Risk Assessment
Surface water	Acute exposure to aquatic and benthic organisms (aquatic and benthic vertebrates and invertebrates)	No risk
	Chronic exposure to aquatic vertebrates	RQs >1 (1.01–146) ^a
	Chronic exposure to aquatic invertebrates	RQs >1 (1.09–18.6) ^a
	Aquatic plants and algae	RQs >1 (1.47–7.22) ^a
Sediment	Benthic organisms	No risk
Air deposition to soil	Soil invertebrates; terrestrial plants	No risk
Trophic transfer	Aquatic and terrestrial organisms	Qualitative; No risk
Biosolids	Terrestrial mammal	Qualitative; No risk
Landfills	Terrestrial mammal	Qualitative; No risk
^a Range of RQs > 1 for 10 COUs across central tendency and high-end exposure estimates for a variety of flow rates, wastewater treatment levels. See Table 5-3 below for details on calculated RQ values.		

Acute Exposure to Aquatic Organisms

The COC for acute exposure to aquatic organisms, including aquatic and benthic vertebrates and invertebrates, was derived from a species sensitivity distribution containing empirical and modeled hazard data ([U.S. EPA, 2025q](#)), which was 287 µg/L DIBP. This acute COC for mortality is based on 96 hours of exposure. Because under all 7Q10 modeled flow conditions for all OES there were no RQs exceeding 1 for acute exposures, EPA did not identify risk for acute exposures to aquatic organisms for DIBP. Thus, under all scenarios, acute exposure of DIBP to aquatic organisms (vertebrates, invertebrates, and benthic invertebrates) did not indicate risk.

Chronic Exposure to Aquatic Benthic Invertebrates

The COC for chronic exposures to aquatic benthic invertebrates was determined from a read-across from DBP in which a COC of 114.3 mg/kg dry sediment was derived from a 10-day study on the midge ([U.S. EPA, 2025q](#)). Under all 7Q10 modeled benthic sediment concentrations for all OESs there were no RQs exceeding 1 for exposures to benthic invertebrates. Thus, under all scenarios, chronic exposure of DIBP to benthic invertebrates did not indicate risk.

Exposure to Aquatic Algae

The COC for exposures to aquatic algae was determined by read-across from DBP in which a COC of 31.6 µg/L was derived from a 96-hour study on green algae ([U.S. EPA, 2025q](#)). Only for one COU/OES were there RQs exceeding 1 calculated for algae. For Processing/Plastic compounding without wastewater removal treatment (direct to surface water), RQs of 7.22 and 1.46 were calculated for P50 flow, high-end and central tendency, respectively (Table 5-3). For this COU/OES with wastewater removal treatment, an RQ above 1 (2.31) was calculated for the P50 flow high-end release only. For all 7Q10 modeled concentrations for all other COU/OES there were no RQs exceeding 1 for exposures to algae.

Chronic Exposure to Aquatic Invertebrates

The COC for chronic exposures to aquatic invertebrates was determined by read across from DBP in which a COC of 12.23 µg/L was derived from a 14-day study on the amphipod crustacean ([U.S. EPA, 2025q](#)). Without wastewater removal treatment (direct to surface water), RQs exceeding 1 were calculated for two COUs/OESs. For Processing/Plastic compounding, RQs of 18.6 and 3.79 were

calculated for high-end and central tendency P50 flow, respectively. For this COU/OES, an RQ of 1.09 was also calculated for high-end P75 flow. For Processing/Plastic converting, an RQ of 2.22 was calculated for high-end P50 flow. With wastewater removal treatment, RQs exceeding 1 were calculated for only one COU/OES. For Processing/Plastic compounding, RQs of 5.97 and 1.21 were calculated for high-end and central tendency P50 flow. For all other 7Q10 modeled concentrations for all other OES there were no RQs for exposures to aquatic invertebrates. Therefore, chronic exposure of DIBP to aquatic invertebrates for Processing/Plastic compounding indicates possible risk at P50 and P75 flow conditions and chronic exposure of DIBP to aquatic invertebrates for Processing/Plastic converting indicates risk at P50 conditions.

Chronic Exposure to Aquatic Vertebrates

The COC for chronic exposures to aquatic vertebrates was determined by read across from DBP in which a COC of 1.56 µg/L was derived from a 112-day study on the Japanese Medaka ([U.S. EPA, 2025g](#)). With and without wastewater removal treatment, RQs exceeding 1 were calculated for six COUs/OESs. Without wastewater removal treatment (direct to surface water) for the highest release COU/OES Processing/Plastic compounding, RQs of 146 and 29.7 were calculated for high-end and central tendency low flow (P50), respectively. Additionally, RQs of 8.52 and 1.72 were calculated for high-end and central tendency medium flow (P75), respectively. With wastewater removal treatment for Processing/Plastic compounding, RQs of 46.8 and 9.50 were calculated for high-end and central tendency low flow (P50), respectively. Additionally, an RQ of 2.73 was calculated for high-end medium flow (P75). Exposure of DIBP to aquatic vertebrates for Processing/Plastic compounding, Processing/Plastic converting, Processing/Incorporation into adhesives and sealants, Processing/Incorporation into paints and coatings, Processing/Rubber manufacturing – compounding, and Processing/Rubber manufacturing – converting preliminarily indicates risk at P50 flow conditions. The COUs/OESs Processing/Plastic compounding and Processing/Plastic converting also preliminarily indicate possible risk to aquatic vertebrates at P75 flow conditions.

For the Use as a catalyst – formulation into pre-catalyst, the modelled concentration did not distinguish the amount or type of discharge (*i.e.*, landfill, incineration, surface water, or combination). However, existing facility release data supports surface water concentrations based on the 7Q10 high-end P75 release without wastewater treatment as reflective of reasonable actual release. At these parameters, an RQ of 4.21 was identified for exposure to aquatic vertebrates. All chronic exposure to aquatic vertebrates with RQs exceeding 1 can be found in Table 5-3.

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Table 5-3. All DIBP COU/OES with Risk Quotients (RQ) >1 for Aquatic Species Exposed to DIBP in Surface Water

COU		OES	Surface Water Release ^a	Flow ^b	WWT ^c (%)	SWC (µg/L)	Risk Quotient (RQ) ^d			
Life Cycle Stage – Category	Subcategory						Chronic Vertebrate	Chronic Invertebrate	Algae	
Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Central tendency	P50	0	46.3	29.7	3.79	1.47	
					68	14.8	9.50	1.21	0.469	
	High-end			P75	0	2.69	1.72	0.220	0.085	
					68	8.61	0.552	0.0704	0.0272	
			P50	0	228	146	18.6	7.22		
				68	73	46.8	5.97	2.31		
	Processing aids, not otherwise listed		P75	0	13.3	8.52	1.09	0.421		
				68	4.26	2.73	0.348	0.135		
Processing – Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastic converting	Central tendency	P50	0	6.25	4.01	0.511	0.198	
					68	2.00	1.28	0.164	0.063	
				High-end	P75	0	0.363	0.233	0.030	0.011
						68	0.116	0.074	0.009	0.004
			P50		0	27.1	17.4	2.22	0.858	
					68	8.67	5.56	0.709	0.274	
			P75	0	1.57	1.01	0.128	0.050		
				68	0.502	0.322	0.041	0.016		
Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Central tendency	P50	0	12	7.69	0.981	0.380	
					68	3.84	2.46	0.314	0.122	
				High-end ^g	P75	0	0.697	0.447	0.057	0.022
						68	0.223	0.143	0.018	0.007
			P50		0	12	7.69	0.981	0.380	
					68	3.84	2.46	0.314	0.122	
			P75	0	0.697	0.447	0.057	0.022		
				68	0.223	0.143	0.018	0.007		

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COU		OES	Surface Water Release ^a	Flow ^b	WWT ^c (%)	SWC (µg/L)	Risk Quotient (RQ) ^d		
Life Cycle Stage – Category	Subcategory						Chronic Vertebrate	Chronic Invertebrate	Algae
Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Central tendency	P50	0	4.10	2.62	0.335	0.130
					68	1.312	0.841	0.107	0.042
				P75	0	0.238	0.153	0.019	0.008
					68	0.076	0.049	0.006	0.002
			High-end	P50	0	8.15	5.22	0.666	0.258
					68	2.61	1.67	0.213	0.083
				P75	0	0.474	0.304	0.039	0.015
					68	0.152	0.097	0.012	0.005
Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – compounding	Central tendency	P50	0	4.28	2.74	0.350	0.135
					68	1.370	0.878	0.112	0.043
				P75	0	0.248	0.159	0.020	0.008
					68	0.079	0.051	0.006	0.003
			High-end	P50	0	5.71	3.66	0.467	0.181
					68	1.83	1.17	0.149	0.058
				P75	0	0.332	0.213	0.027	0.011
					68	0.106	0.068	0.009	0.003
Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – converting	Central tendency	P50	0	4.58	2.94	0.374	0.145
					68	1.466	0.939	0.120	0.046
				P75	0	0.266	0.171	0.022	0.008
					68	0.085	0.055	0.007	0.003
			High-end	P50	0	6.17	3.96	0.504	0.195
					68	1.97	1.27	0.161	0.062
				P75	0	0.359	0.230	0.029	0.011
					68	0.115	0.074	0.009	0.004
Processing – Incorporation into formulation, mixture, or reaction product	Use as a catalyst	Use as a catalyst – formulation into pre-catalyst	High-end	P75	0	6.57 ^e	4.21	0.54	0.21

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COU		OES	Surface Water Release ^a	Flow ^b	WWT ^c (%)	SWC (µg/L)	Risk Quotient (RQ) ^d		
Life Cycle Stage – Category	Subcategory						Chronic Vertebrate	Chronic Invertebrate	Algae
Commercial Use - Other Uses	Laboratory Chemicals	Use of Laboratory Chemicals – Liquid	Central tendency	P50	0	53.3	34.2 ^f	4.36 ^f	1.69 ^f
					68	17.1	10.9 ^f	1.39 ^f	0.54 ^f
				P75	0	3.10	1.99 ^f	0.25 ^f	0.10 ^f
					68	0.99	0.64 ^f	0.08 ^f	0.03 ^f
			High-end	P50	0	101	64.7 ^f	8.26 ^f	3.20 ^f
					68	32.3	20.7 ^f	2.64 ^f	1.02 ^f
				P75	0	5.88	3.77 ^f	0.48 ^f	0.19 ^f
					68	1.88	1.21 ^f	0.15 ^f	0.06 ^f
COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario (basis of release estimate); SWC = surface water concentration; RQ = risk quotient; WWT = wastewater treatment									
^a Central tendency and high-end represent the median and 95th percentile of environmental release, respectively.									
^b Flow rates for P50 and P75 are 36,950 and 634,500 m ³ /day respectively.									
^c Percentage of DIBP removed with wastewater treatment (WWT) was determined from (U.S. EPA, 1982)									
^d Concentrations of concern (COC) are 1.56 µg/L for chronic vertebrate, 12.26 µg/L for chronic invertebrate, and 31.6 µg/L for algae.									
^e Modeled value supported by existing facility release data.									
^f EPA has slight confidence in the calculated RQs for these OES. See Section 5.3.4.									
^g Modeled releases did not have a distribution, so CT and HE are the same.									

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5.3.3 Risk Characterization for Terrestrial Receptors

EPA calculated an RQ for terrestrial organisms based on modeled DIBP soil concentrations via air deposition to soil near facilities that release DIBP. The Agency relied on the IIOAC modeled concentrations and deposition rates to characterize ecological exposure. DIBP releases were estimated and used as a direct input to the IIOAC Model ([U.S. EPA, 2025t](#)). Environmental RQs for terrestrial organisms associated with air deposition to soil can be found in Table 5-4. DIBP releases were estimated and used as a direct input to the IIOAC Model ([U.S. EPA, 2025t](#)).

Table 5-4. Environmental Risk Quotients (RQs) for Terrestrial Organisms Associated with Air Deposition to Soil Releases of DIBP

OES	Soil Concentration	Organism	Exposure Duration (days)	Hazard Value	RQ
All	0.000003530 mg/kg (365-day release)	Springtail (<i>Folsomia fimetaria</i>); soil invertebrate	21	14 mg/kg	2.56 E-07
		Bread wheat (<i>Triticum aestivum</i>); terrestrial plant	40	10 mg/kg	3.59 E-07

Air Deposition to Soil

Modeling results indicate a rapid decline in DIBP concentrations from air deposition to soil. The annual average deposition rates from fugitive and stack releases of DIBP to soil at 100 m was 0.193 and 0.0259 mg/m², respectively, for a total annual deposition rate of 0.219 mg/m². This annual deposition rate corresponds to an annual contribution to average soil concentration of 3.530×10^{-6} mg/kg/yr. Because DIBP has low bioaccumulation potential and experiences biodilution across trophic levels ([U.S. EPA, 2024f](#)), its transfer through food webs is expected to experience trophic dilution and will be less than the amount deposited to soil. For soil invertebrates and terrestrial plants, the hazard values are seven orders of magnitude higher than the estimated soil concentration, with RQ values of 2.56×10^{-7} and 3.59×10^{-7} , respectively (Table 5-4). Therefore, COU/OES based fugitive and stack air releases of DIBP and subsequent deposition to soil are not expected to produce environmental concentrations leading to hazardous effects within soil invertebrates or terrestrial plants. EPA did not identify risk to terrestrial invertebrates or plants due to low soil exposure concentrations relative to hazard values in soil.

Landfill

No studies have directly evaluated the presence of DIBP in landfill or waste leachate. Due to its high affinity for organic carbon and organic media (log K_{OC} = 2.67, log K_{OW} = 4.34), DIBP is expected to be present at low concentrations in landfill leachate ([U.S. EPA, 2025s](#)). Further, no studies were identified that reported the concentration of DIBP in landfills or in the surrounding areas. DIBP that might be present in landfill leachates is not expected to be mobile in receiving soils and sediments due to its high affinity for organic carbon.

There is limited information regarding DIBP in dewatered biosolids, which may be sent to landfills for disposal. DIBP has been identified in wastewater sludge in the United States and Canada ([Ikonomou et al., 2012](#)), as well as at various facilities across China ([Zhu et al., 2019](#); [Meng et al., 2014](#)). A 2012 survey of North American wastewater plants identified DIBP in sludge at concentrations ranging from 0.1 to 76.7 ng/g dry weight ([Ikonomou et al., 2012](#)). These reported concentrations were well below hazard values for benthic organisms (114.3 mg/kg; 1 ng/g is equivalent to 0.001 mg/kg) and below concentrations that might be expected to transfer up the food web via trophic transfer and potentially affect terrestrial organisms. DIBP is not likely to be persistent in groundwater/subsurface environments

unless anoxic conditions exist. As a result, the qualitative evidence indicates that DIBP migration from landfills to surface water and sediment is limited and not likely to pose risk to aquatic and terrestrial organisms.

Biosolids

DIBP has been identified in several U.S.-based and international surveys of wastewater sludge, composted, and stabilized biosolids. As noted above, a 2012 survey of North American wastewater plants identified DIBP in sludge at concentrations ranging from 0.1 to 76.7 ng/g dry weight ([Ikonomou et al., 2012](#)). There are currently no U.S.-based studies reporting DIBP concentration in soil after land application. DIBP containing sludge and biosolids have not been reported for uses in surface land disposal or agricultural application.

No anaerobic or aerobic degradation studies were identified for DIBP. However, similar phthalates including its primary isomer, dibutyl phthalate (DBP), reported half-lives in soil ranging from hours to several hundred days ([Net et al., 2015](#)). Based on the solubility (6.2 mg/L) and hydrophobicity ($\log K_{oc} = 2.67$, $\log K_{ow} = 4.34$), DIBP is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms.

Concentrations of DIBP in soil following agricultural application of municipal biosolids were not identified from the Toxics Release Inventory (TRI) or National Emissions Inventory (NEI) release data nor were any monitoring studies identified during systematic review. As such, DIBP concentrations in soil were estimated using the concentrations identified in sludge concentrations ranging from 0.1 to 76.7 ng/g dry weight ([Ikonomou et al., 2012](#)). See Table 3-2 in the *Draft Environmental Media and General Population Exposure for Diisobutyl phthalate (DIBP)* ([U.S. EPA, 2025s](#)). This is several orders of magnitude below the hazard values for benthic organisms (114.3 mg/kg), soil organisms (14 mg/kg) or terrestrial plants (10 mg/kg). These comparisons support the conclusion that potential DBP concentrations in biosolids do not present risk to environmental organisms.

Distribution in Commerce

EPA evaluated activities resulting in exposures associated with distribution in commerce throughout the various life cycle stages and COUs (*e.g.*, manufacturing, processing, industrial use, commercial use, disposal) rather than a single distribution scenario. Data were not reasonably available for the Agency to assess risks to the environment from environmental releases and exposures related to distribution of DIBP in commerce as a single OES. However, EPA expects all the DIBP or DIBP-containing products and/or articles to be transported in closed system or otherwise to be transported in a form (*e.g.*, articles containing DIBP) such that there is negligible potential for releases except during an incident (*e.g.*, spill during transportation). Therefore, no separate assessment was performed for estimating releases and exposures from distribution in commerce.

5.3.4 Overall Confidence and Remaining Uncertainties Confidence in Environmental Risk Characterization

The overall confidence in the environmental risk characterization synthesizes confidence from environmental exposures and environmental hazards. Exposure confidence is detailed in the *Draft Environmental Media, General Population, and Environmental Exposure Assessment* for Diisobutyl phthalate (DIBP) ([U.S. EPA, 2025s](#)). Hazard confidence is detailed in the *Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025q](#)).

Exposure

Because of the lack of reported release data for facilities discharging DIBP to surface waters, releases were modeled, and the high-end release estimate for each COU was applied for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant NAICS codes, and that had NPDES permits. EPA has overall slight to moderate confidence in the modeled concentrations as being representative of actual releases, with a slight bias toward overestimation when pairing lower flow rates with higher releases and assuming no wastewater treatment. The high-end modeled concentrations in the surface water and sediment exceeded the highest values available from monitoring studies. Monitoring studies can be found in the *Draft Environmental Media, General Population, and Environmental Exposure Assessment* for Diisobutyl phthalate (DIBP) ([U.S. EPA, 2025s](#)).

EPA has overall slight to moderate confidence in the release data and the resulting modeled surface water concentrations at the point of release in the receiving water body for those OESs in which surface water release was indicated, with a slight bias toward over-estimation. For the seven OESs in which the type of discharge did not specify the amount of surface water release, EPA examined other lines of evidence where available for support of modelled concentrations including actual release facility release data and/or comparison to facility release data from DBP. For three OESs, Use as a catalyst – formulation into pre-catalyst, Repackaging into large and small containers, and Application of paints and coatings, other lines of evidence were available for comparison to the modelled surface water concentrations (Section 5.3.2). EPA has slight to moderate confidence in the environmental risk characterization for these OES. For Use as a catalyst – intermediate in polypropylene manufacturing, Application of adhesives and sealants, and Use of laboratory chemicals – solids, with the conservative assumption of 100 percent release to surface water without wastewater treatment, no RQs exceeded 1. EPA has slight to moderate confidence in the environmental risk characterization for these OESs. Lastly for Use of laboratory chemicals – liquid, no other lines of evidence were available for comparison of modelled DIBP surface water concentrations. Therefore, EPA has slight confidence in the environmental risk characterization for this OES.

DIBP did not have reasonably available facility reported release data for air deposition (*e.g.*, TRI or NEI). Therefore, DIBP releases were estimated and used as a direct input to the IIOAC Model. EPA has moderate confidence in the IIOAC-modeled results used to characterize exposures and deposition rates ([U.S. EPA, 2025s](#)). Information on the presence of DIBP in landfills is limited and there are uncertainties in the relevancy of the landfill leachate monitoring data to the COUs considered in this evaluation. However, as noted previously, no studies were identified that reported the concentration of DIBP in landfills or in the surrounding areas and DIBP is unlikely to be present in landfill leachates and migrate through groundwater. There is considerable uncertainty in the applicability of using generic release scenarios and wastewater treatment plant modeling software to estimate concentrations of DIBP in biosolids. There is limited reasonably available measured data on concentrations of DIBP in biosolids or soils receiving biosolids, and there is uncertainty that concentrations used in this analysis are representative of all types of environmental releases. However, the high-quality biodegradation rates and physical and chemical properties suggest that DIBP will have limited persistence potential and mobility in soils receiving biosolids. There is robust confidence that DIBP in soils will not be mobile and will have low persistence potential due to the high confidence in the biodegradation rates and physical and chemical properties.

Environmental Hazard

In the aquatic environment, EPA has robust confidence that DIBP poses hazard from acute exposure to aquatic species at 287 µg/L. The data are supported by SSD analysis conducted with empirical data from two acute DIBP aquatic hazard studies, seven acute DBP aquatic hazard values, and supplemented with predicted values calculated through Web-ICE. A limitation and source of uncertainty in the assessment of hazards from chronic exposure to aquatic organisms is the lack of available data. Because no chronic exposure duration aquatic studies were available for the assessment of hazards from DIBP exposure, read-across was conducted using DBP ([U.S. EPA, 2025q](#)). DBP was considered an appropriate analog for DIBP based on structural similarity, similar physical, chemical, environmental fate and transport behavior in water and sediment, as well as similar ecotoxicological behavior in aquatic taxa (see Appendix A of the *Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025q](#))). EPA has robust confidence that DIBP poses hazard to aquatic vertebrates, invertebrates, and benthic invertebrates from a chronic exposure. This robust confidence is supported by the quality and consistency of the analog DBP chronic aquatic vertebrate, invertebrate, and benthic invertebrate database. Read-across from DBP was also conducted for aquatic plants and algae. However, only one species of algae was available for the assessment of potential hazards from DBP ([U.S. EPA, 2025q](#)); therefore, EPA has overall moderate confidence in the hazard for the DIBP aquatic plants and algae assessment. For more information on analog selection, see Appendix A of ([U.S. EPA, 2025q](#)).

In the terrestrial environment, EPA has moderate confidence that DIBP poses hazard to mammals, and robust confidence that DIBP poses hazard to invertebrates and plants. The conclusion that DIBP poses hazard to terrestrial mammals at a dietary dose of 353 mg/kg/day is supported by evidence obtained from laboratory rodent studies used as human health models. Utilizing human health rodent models as a surrogate for terrestrial models introduces uncertainty into the terrestrial hazard characterization because these species may not fully represent effects observed in wild animal populations. The conclusion that DIBP poses hazard to terrestrial invertebrates is based a study that identified significant reproduction effects in the Springtail (*Folsomia fimetaria*) ([Jensen et al., 2001](#)). The strength of the database and identified hazard value is supported by the robust consistency, strength and precision, and biological gradient of the study results. EPA has moderate confidence that DIBP poses hazard to terrestrial plants. This confidence is supported by the quality and consistency of the analog DBP terrestrial plant database ([U.S. EPA, 2025q](#)).

Trophic Transfer

EPA did not conduct a quantitative analysis of DIBP trophic transfer. Due to the physical and chemical properties, environmental fate, and exposure parameters of the DIBP, it is not expected to persist in surface water, groundwater, or air. DIBP has a water solubility of 6.2 mg/L, a log K_{OC} value of 2.67, an estimated BCF value of 30.2 L/kg, and a terrestrial biota-sediment accumulation factor (BSAF) between 0.18 and 0.46 kg/kg. DIBP is expected to have low bioaccumulation potential and no biomagnification potential, and therefore expected to display trophic dilution. For further information on the sources of these values, please see the *Draft Chemistry, Fate, and Transport Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2024f](#)). Given the reasonably available data, EPA has robust confidence that that DIBP is found in relatively low concentrations (or not at all) in aquatic organism tissues, especially at higher trophic levels. Furthermore, DIBP has low bioaccumulation and biomagnification potential in aquatic and terrestrial organisms, and thus low potential for trophic transfer through food webs. EPA therefore does not expect risk from trophic transfer in wildlife at environmentally relevant concentrations of DIBP.

6 UNREASONABLE RISK DETERMINATION

TSCA section 6(b)(4) requires EPA to conduct a risk evaluation to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other nonrisk factors, including an unreasonable risk to a PESS identified by EPA as relevant to this risk evaluation, under the COUs.

EPA is preliminarily determining that DIBP presents unreasonable risk of injury to health and the environment driven by identified unreasonable risk to workers under two COUs and identified risks to the environment under four COUs due to chronic exposure to DIBP based on direct releases to surface water. This preliminary unreasonable risk determination is based on the information in previous sections of this draft risk evaluation, the appendices, and technical support documents of this draft risk evaluation in accordance with TSCA section 6(b). This preliminary unreasonable risk determination and the underlying evaluation are consistent with the best available science (TSCA section 26(h)) and based on the weight of scientific evidence (TSCA section 26(i)).

As noted in the Executive Summary, DIBP is primarily used as a plasticizer in polyvinyl chloride (PVC) in consumer, commercial, and industrial applications—although it is also used as a stabilizing agent in the manufacturing of adhesives, paint, coatings, rubbers, and non-PVC plastic products.

EPA notes that human or environmental exposure to DIBP through non-TSCA uses (*e.g.*, cosmetics, use of shells and cartridges as identified in 26 U.S.C. § 4181, and food additives such as food contact materials) were not evaluated by the Agency because these uses are explicitly excluded from TSCA's definition of chemical substance. Thus, it is not appropriate to extrapolate from this preliminary risk determination to form conclusions about uses of DIBP that are not subject to TSCA and that EPA did not evaluate.

Additionally, where relevant, the Agency analyzed aggregate exposures and cumulative risk. Aggregate exposure analyses consider effects on populations that are exposed to DIBP via multiple routes (*e.g.*, dermal contact, ingestion, and inhalation). Cumulative risk analysis considers human health risks related to exposures to multiple chemicals. EPA included DIBP in its draft cumulative risk analysis TSD along with five other toxicologically similar phthalate chemicals (*i.e.*, DEHP, DINP, DBP, BBP, and DCHP that are also being evaluated under TSCA ([U.S. EPA, 2025ad](#)). Based on the *Revised Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* ([U.S. EPA, 2025ad](#)), the Agency has considered the draft cumulative risk (*i.e.*, human health risks related to exposures to multiple phthalates) and the NHANES biomonitoring data in this preliminary DIBP unreasonable risk determination. Additional discussion about EPA's preliminary unreasonable risk determination for consumer uses is provided in Section 6.1.5, and information about the cumulative risk considerations and analysis is provided in Section 4.4.

The COUs evaluated for DIBP are listed in Table 1-1. EPA is preliminarily determining that the following COUs significantly contribute to unreasonable risk of injury to human health:

- Industrial use – adhesives and sealants – two-component glues and adhesives; transportation equipment manufacturing (inhalation exposure for workers from spray applications); and
- Commercial use – adhesives and sealants – two-component glues and adhesives (inhalation exposure for workers from spray applications).

EPA is preliminarily determining that the following COUs significantly contribute to unreasonable risk of injury to the environment:

- Processing – incorporation into formulation, mixture, or reaction product – plasticizer (plastic product manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and
- Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production).

EPA preliminarily did not identify an unreasonable risk of injury to health or the environment from the following 22 COUs:

- Manufacturing – domestic manufacturing;
- Manufacturing – import;
- Processing – incorporation into formulation, mixture, or reaction product – Plastic and rubber products not covered elsewhere;
- Processing – as a reactant – intermediate (plastic manufacturing);
- Processing – repackaging (*e.g.*, laboratory chemicals);
- Processing – incorporation into article – plasticizer (plastic product manufacturing; transportation equipment manufacturing);
- Processing – recycling;
- Distribution in commerce;
- Industrial use – foam – pipeline pigs;
- Industrial use – paints and coatings
- Industrial use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial use – toys, playground, and sporting equipment;
- Commercial use – paints and coatings;
- Commercial use – laboratory chemicals;
- Consumer use – adhesives and sealants;
- Consumer use – fabric, textile, and leather products not covered elsewhere;
- Consumer use – floor coverings;
- Consumer use – toys, playground, and sporting equipment;
- Consumer use – paints and coatings;
- Consumer use – other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); and
- Disposal.

For some COUs, the Agency has limited reasonably available information to derive risk estimates, such as MOEs or RQs, to support a determination of whether the COU significantly contributes to the unreasonable risk of injury to human health and the environment. EPA integrates reasonably available information, *e.g.*, read-across evidence, physical and chemical properties, available monitoring data, in a risk characterization using a weight of evidence approach and professional judgment to support conclusions. The risk characterizations of COUs without risk estimates are a best estimate of what EPA expects given the weight of scientific evidence without overstating the science.

The unreasonable risk determination must be informed by science; and in making a finding of “presents unreasonable risk,” EPA considers risk-related factors beyond exceedance of benchmarks. Risk-related factors include the type and severity of health effects under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), or population exposed—including populations with greater exposure or greater susceptibility [PESS]), and the confidence in the information used to inform the hazard and exposure values. EPA also considers, where relevant, the Agency’s analyses on aggregate exposures and cumulative risk. For COUs evaluated quantitatively, as described in the risk characterization, EPA based the risk determination on the risk estimate that best represented the COU. Additionally, in the risk evaluation, the Agency describes the strength of the scientific evidence supporting the human health and environmental assessments as robust, moderate, slight, or indeterminate.

Robust confidence suggests thorough understanding of the scientific evidence and uncertainties, and the supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the risk estimates. Moderate confidence suggests some understanding of the scientific evidence and uncertainties, and the supporting scientific evidence weighed against the uncertainties is reasonably adequate to characterize risk. Slight confidence is assigned when the weight of scientific evidence may not be adequate to characterize the risk, and when the Agency is making the best scientific assessment possible in the absence of complete information. This risk evaluation discusses important assumptions and key sources of uncertainty in the risk characterization, and these are described in more detail in the respective weight of scientific evidence conclusions sections for fate and transport (Section 2.2), environmental release (Section 3.2.2), environmental concentrations (Section 3.3.1), environmental exposures and hazards (Section 5.3.4), and human health exposures and hazards (Sections 4.1.1.4, 4.1.2.4, and 4.1.3.3). It also includes overall confidence and remaining uncertainties sections for the human health (Sections 4.3.2.1, 4.3.3.1, and 4.3.4.1) and environmental (Section 5.3.4) risk characterizations. In general, EPA makes an unreasonable risk determination based on risk estimates that have an overall confidence rating of moderate or robust because those confidence ratings indicate the scientific evidence is adequate to characterize risk estimates despite uncertainties or is such that it is unlikely the uncertainties could have a significant effect on the risk estimates.

6.1 Human Health

Calculated non-cancer risk estimates (MOEs⁸) can provide a risk profile of DIBP by presenting a range of estimates for different health effects for different COUs. When characterizing the risk to human health from occupational exposures during risk evaluation under TSCA, EPA conducts baseline assessments of risk and makes its determination of unreasonable risk in a manner that takes into consideration reasonably available information (*e.g.*, test order information; multiple, representative site visits) regarding whether use of respiratory protection or other PPE is standard practice at all sites.⁹ This allows EPA to make unreasonable risk determinations based on the information regarding workers wearing PPE where the Agency has confidence that the information is representative. In addition, the risk estimates are based on exposure scenarios with monitoring data that reflect existing requirements, such as those established by OSHA or industry or sector best practices. In this risk evaluation, the risk estimates calculated do not reflect use of PPE; however, Table 4-16 provides more information on PPE that could be used to reduce the exposures, so that the risk estimates would be above the benchmark

⁸ EPA derives non-cancer MOEs by dividing the non-cancer POD (HEC [mg/m³] or HED [mg/kg-day]) by the exposure estimate (mg/m³ or mg/kg-day). Section 4.3.1 has additional information on the risk assessment approach for human health.

⁹ It should be noted that, in some cases, baseline conditions may reflect certain mitigation measures, such as engineering controls, in instances where exposure estimates are based on monitoring data at facilities that have engineering controls in place.

MOE. EPA does not currently have reasonably available information regarding use of PPE under the COUs and therefore the risk determination is based on the risk estimates that do not reflect use of PPE. Any additional information received in public comment further describing current PPE practices would be considered in the final risk evaluation.

To characterize risk from non-cancer endpoints, the estimated MOEs are compared to their respective benchmark MOE. The benchmark MOE accounts for the total uncertainty in a POD. The benchmark MOE is the total of several individual uncertainty factors relevant to a given POD with values usually of 1, 3, or 10. For DIBP, two uncertainty factors were used to derive a benchmark MOE: (1) UF_A of $3\times$ for the uncertainty in extrapolating animal data to humans (*i.e.*, interspecies variability) and (2) UF_H of $10\times$ for the variation in sensitivity among the members of the human population (*i.e.*, intraspecies variability/human variability). Therefore, the benchmark MOE for DIBP is 30 based on effects on the developing male reproductive system, and was used to characterize risk from exposure to DIBP for acute, intermediate, and chronic exposure scenarios. A lower benchmark MOE (*e.g.*, 30) indicates greater certainty in the data (because the total uncertainty factor (UF) for the relevant POD is low). A higher benchmark MOE (*e.g.*, 100) would indicate more extrapolation uncertainty for specific hazard endpoints and scenarios. Additional information regarding the non-cancer hazard identification and the benchmark MOE is in Section 4.2.2 of this draft risk evaluation. An MOE that is less than the benchmark MOE is a starting point for informing a determination of unreasonable risk of injury to health, based on non-cancer effects. It is important to emphasize that these calculated risk estimates alone are not “bright-line” indicators of unreasonable risk.

6.1.1 Populations and Exposures EPA Assessed for Human Health

EPA has evaluated risk to workers (16+ years old), including ONUs and females of reproductive age directly working with DIBP; consumers and bystanders (adults and children); and the general population (including fenceline communities) using reasonably available monitoring and modeling data for inhalation, dermal, and ingestion exposures, as applicable. The Agency has evaluated risk from inhalation, incidental ingestion of inhaled dust, and dermal exposure of DIBP to workers, including ONUs. The Agency has also evaluated risk from inhalation, dermal, and ingestion exposures for consumers. For the general population, EPA has evaluated risk from (1) ingestion exposures via drinking water, incidental surface water ingestion during swimming, fish ingestion (including subsistence and Tribal fishers), and soil ingestion by children; (2) dermal exposure to surface water during swimming; (3) acute and chronic inhalation exposure; and (4) exposures measured through urinary biomonitoring (*i.e.*, NHANES data). The Agency concluded it is not necessary to separately model risks to infants consuming the human milk of exposed women because the POD used in the assessment is based on an earlier developmental timepoint of male reproductive effects during gestation resulting from maternal exposures, as examined in animal studies. EPA therefore has confidence that the risk estimates calculated based on maternal exposures are protective of a nursing infant’s greater susceptibility during this unique lifestage whether due to sensitivity or greater exposure per body weight. Descriptions of the data used for human health exposure are in Sections 4.1 of this risk evaluation. Uncertainties for overall exposures are presented in the respective occupational, consumer, and general population exposure sections of this draft risk evaluation and are considered in the preliminary unreasonable risk determination.

6.1.2 Summary of Human Health Effects

EPA has preliminarily determined that the unreasonable risk presented by DIBP is due to non-cancer phthalate syndrome-related effects on the developing male reproductive system (*i.e.*, decreased fetal testicular testosterone) in the following population:

- Workers, including ONUs, from inhalation exposure.

Although exposure levels were modeled, and not based on worker exposure data, with respect to health endpoints upon which EPA has based this preliminary unreasonable risk determination, the Agency has robust confidence in the developmental toxicity POD. The POD is based on phthalate syndrome-related effects on the developing male reproductive system (*i.e.*, decreased fetal testicular testosterone) and was derived using BMD modeling. Risk estimates based on the POD are relevant for females of reproductive age and males at any lifestage. Decreased fetal testicular testosterone is the most sensitive endpoint. Additionally, there is epidemiological evidence that DIBP exposure can adversely affect the developing male reproductive system consistent with phthalate syndrome in males of any age, and that DIBP exposure at higher concentrations can cause other health effects in females as well (see the *Draft Non-cancer Human Health Hazard Assessment for DIBP* ([U.S. EPA, 2025w](#))). Therefore, EPA considers the proposed decreased fetal testicular testosterone POD to be relevant across sex, lifestage, and durations. The confidence in the POD and descriptions of the data used to determine the human health effects from DIBP are explained in Section 4.2.2. More information about EPA's confidence in the health hazard of DIBP is in Section 4.2.2.

DIBP has not been evaluated for carcinogenicity in any 2-year cancer bioassays. EPA therefore evaluated the relevance of read-across approaches to assess potential cancer hazards of DIBP based on cancer bioassays and MOA information available for other phthalates being evaluated under TSCA (*i.e.*, DEHP, DBP, BBP, DCHP, DINP, DIDP) as discussed in the *Draft Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* ([U.S. EPA, 2025b](#)). EPA preliminarily concludes that potential carcinogenicity of DIBP is not a significant remaining source of uncertainty in the quantitative and qualitative risk characterization, despite the lack of carcinogenicity bioassays for DIBP. This is because EPA does not consider DIBP likely to be genotoxic or mutagenic to humans based on read-across from DEHP, BBP, DBP, DINP and DIDP. DIBP is toxicologically similar to DEHP, DBP, BBP, DINP, and DCHP, and the effects on the developing male reproductive system consistent with phthalate syndrome was the most sensitive and robust endpoint for deriving PODs for use in characterizing risk for acute, intermediate, and chronic exposure scenarios. EPA has determined that quantitative cancer risk assessment is not needed for the read-across phthalates because available studies indicate that DEHP, BBP, DBP, DIBP, DCHP, DINP, and DIDP are not direct-acting genotoxicants or mutagens. More information about the cancer human health hazards of DIBP is in Section 4.2.3.

The health risk estimates (MOEs) for workers (including ONUs), consumers, the general population, and PESS presented in Section 4.3.2 (workers), Section 4.3.3 (consumers), Section 4.3.4 (general population), and Section 4.3.5 (PESS) are not "bright lines," and EPA has discretion to consider other risk-related factors when concluding whether a COU significantly contributes to the unreasonable risk.

6.1.3 Basis for Unreasonable Risk to Human Health

In developing the exposure and hazard assessments for DIBP, EPA has analyzed reasonably available information to ascertain whether some human populations may have greater exposure and/or susceptibility than the general population to the hazard posed by DIBP. For the DIBP draft risk evaluation, EPA has accounted for the following PESS: females of reproductive age, pregnant women, male infants, male children, and male adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, people in proximity to releasing facilities, including fenceline communities, and Tribes and subsistence fishers whose diets include large amounts of fish. Section 4.3.5 summarizes how PESS were incorporated into the risk evaluation through consideration of potentially increased exposures and/or potentially increased

biological susceptibility and summarizes additional sources of uncertainty related to consideration of PESS.

EPA was able to calculate risk estimates for certain PESS groups (*e.g.*, female workers of reproductive age, and infants and children) (see Section 1.1.3). In past EPA risk evaluations, where EPA did not have specific PESS data, the Agency relied on high-end or conservative exposures to account for risk to PESS populations. However, because reasonably available data on PESS groups are included in the DIBP assessment, exposure estimates based on inputs and scenarios that are representative and/or likely to occur are generally protective of PESS and, for DIBP, the more conservative high-end risk estimates were not needed in order to account for risk to PESS groups. Therefore, as explained in the human health risk characterization, for most occupational COUs, central tendency risk estimates were used to preliminarily determine unreasonable risk since they are protective of PESS. Additionally, the UF_H of 10 for human variability that EPA has applied to MOEs accounts for increased susceptibility of populations. The non-cancer POD for DIBP selected by EPA for use in risk characterization is based on the most sensitive developmental effect (*i.e.*, reduced fetal testicular testosterone production) observed and is expected to be protective of susceptible subpopulations. More information on how EPA characterized sentinel and aggregate risks is provided in Section 4.1.5, and more information on how EPA characterized PESS risks is provided in Section 4.3.5.

EPA considered combined exposure across all routes of exposure for each individual occupational and consumer COU to calculate aggregate risks (Sections 4.3.2 and 4.3.3). The Agency aggregated exposures across routes for workers, including ONUs, and consumers for COUs with quantitative risk estimates. However, EPA did not consider aggregate exposure scenarios across COUs because the Agency did not find any evidence to support such an aggregate analysis, such as statistics of populations using certain products represented across COUs, or workers performing tasks across COUs based on the reasonably available information. See Section 4.1.5 for more information. EPA employed a risk screening approach for the general population exposure assessment.

In addition to the analysis done for DIBP alone (referred to as “individual analysis”), EPA applied both the methods and principles of CRA (*Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c), as well as the *Revised Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* ([U.S. EPA, 2025ad](#)), to derive non-cancer risk estimates for occupational and consumer exposures. EPA’s draft CRA includes cumulative exposure to other toxicologically similar phthalates being evaluated under TSCA (*i.e.*, DEHP, DBP, BBP, DCHP, and DINP) and uses a “relative potency factor” (RPF) analysis to characterize risk. Using a meta-analysis and BMD modeling approach to model decreased fetal testicular testosterone, EPA derived a draft RPF for DIBP of 0.53 based on BMD₄₀ (benchmark dose [mg/kg-day]). This means DIBP exposures, when multiplied by the relative potency factor, are decreased by 47 percent to be expressed in terms of index chemical (*i.e.*, DBP) equivalent exposures, and that a 100 mg/kg-day dose of DIBP would present the same risk as a 53 mg/kg-day dose of DBP.

The revised draft CRA TSD also includes the addition of a non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP as estimated from NHANES urinary biomonitoring data using reverse dosimetry. The NHANES exposure is non-attributable—meaning it cannot be attributed to specific COUs or other sources that may result in high-dose exposure scenarios (*e.g.*, occupational

exposures to workers), but likely includes exposures attributable to both COUs assessed under TSCA and other sources (*e.g.*, diet, food packaging, cosmetics).

6.1.4 Workers

Based on the occupational risk estimates and related risk factors, EPA is preliminarily determining that DIBP presents unreasonable risk due to

- non-cancer risks from spray applications of adhesives and sealants due to acute inhalation exposure to workers; and
- non-cancer risks from spray applications of adhesives and sealants due to acute inhalation exposure to ONUs.

More information on occupational risk estimates is in Section 4.3.2. The occupational risk determination is not impacted by the results from the cumulative risk assessment—even with the addition of non-attributable cumulative exposure NHANES urinary biomonitoring data. More information and discussion can be found in Section 4.4.4. EPA's confidence in the cumulative MOEs for workers is moderate to robust (Section 4.4.4.1).

EPA is preliminarily determining that two COUs associated with spray application of adhesives and sealants—(1) Industrial use of adhesives and sealants in two-component glues and adhesives, and transportation equipment manufacturing and (2) Commercial use of adhesives and sealants in two-component glues and adhesives—significantly contribute to the unreasonable risk of injury to health for workers and ONUs. Risk estimates based on high-end and central tendency exposures were considered for acute inhalation associated with the spray application of adhesives and sealants, and these high-end MOEs were used in preliminarily determining unreasonable risk for the associated industrial and commercial use COUs. Central tendency risk estimates were considered for intermediate and chronic inhalation exposure durations, as well as dermal exposure risk estimates for these two COUs. For all other COUs, EPA considered the central tendency risk estimates for inhalation and dermal exposures of all durations, due to uncertainties associated with each OES mapped to occupational COUs, as described in Section 4.3.2.

Because systematic review of literature sources did not identify reasonably available inhalation monitoring data for multiple COUs, such as the Industrial and commercial applications of adhesives and sealants and paints and coatings, EPA assessed the central tendency and high-end 8-hour TWA vapor inhalation exposure concentrations of these COUs to be equal to the corresponding values of the DIBP manufacturing COU. For multiple COUs where no reasonably available information was identified describing the concentration of DIBP in mist in the workplace, the exposure and risk estimates are based on the conservative assumption that worker DIBP mist inhalation exposure concentration is equal to worker DIBP mist inhalation exposure concentration in the DIBP manufacturing COU. For more information on COUs using surrogate modeling, see Table 4-4.

As previously mentioned, EPA expects central tendency estimates to be the most reflective of worker exposures within the DIBP COUs and, for most COUs, is using the central tendency risk estimates as a starting point to preliminarily determine unreasonable risk due to inhalation exposure. However, for the spray application of liquid adhesives, due to a confluence of a subset of variables (*e.g.*, low ventilation, high-pressure spray, etc.), EPA used the high-end risk estimates (*i.e.*, acute MOE of 1.9 for females of reproductive age) because it is considered plausible for exposures to mist containing DIBP to occur in an acute 1-day scenario. Therefore, for these two COUs (*i.e.*, Industrial use – adhesives and sealants; Commercial use – adhesives and sealants), EPA's preliminary risk determination of unreasonable risk to workers is based on the estimates associated with the high-end scenario of acute inhalation. Note that,

although EPA considers high-end to be the appropriate risk estimates for spray application of adhesives and sealants, the central tendency estimates for these uses also indicate risk, with MOEs below the benchmark MOE (*i.e.*, acute MOE of 20 for females of reproductive age). For EPA's preliminary risk determination for ONU inhalation exposure, EPA used worker central tendency data as analogous data for ONU exposure (*i.e.*, MOE of 22 for ONUs). EPA has slight to moderate confidence in its assessed inhalation exposure estimates for ONUs and requests comment on ONU exposure inputs. EPA did not use high-end for COUs associated with spray application of paints and coatings due to having slight confidence in those high-end risk estimates stemming from uncertainty about the DIBP concentrations in paints and coatings products. No other COUs significantly contribute to unreasonable risk of DIBP to workers due to inhalation exposure.

Dermal exposure risk estimates for COUs in the individual analysis were analyzed using acute, intermediate, and chronic potential scenarios. Risks are not indicated at central tendency or high-end for any dermal exposure scenarios of any COU. Additional information on occupational risk estimates is provided in Section 4.3.2 of this draft risk evaluation.

EPA has moderate confidence overall in the risk estimates calculated for females of reproductive age and average adult workers inhalation and dermal exposure scenarios—except for high-end inhalation exposure in the paints and coatings OESs that have slight confidence. The Agency has slight to moderate confidence in the assessed inhalation exposures for ONUs and slight to moderate confidence in the assessed ONU dermal exposures. Further information on EPA's confidence in these risk estimates and the uncertainties associated with them can be found in Section 4.3.2.1.

EPA assessed two occupational COU without deriving risk estimates:

- Distribution in commerce: EPA expects DIBP to be transported in sealed containers from import sites to downstream processing and use sites, or for final disposal. EPA expects under standard operating procedures, along with the expectation that DIBP would be transported in a closed system, that there is negligible potential for releases. Therefore, no occupational exposures are reasonably expected to occur, and EPA preliminarily determines that DIBP exposures and releases that could occur during distribution in commerce do not significantly contribute to the unreasonable risk.
- Industrial Use – Foam – Pipeline pigs: EPA assessed worker and ONU inhalation exposures in the case of the Manufacture of Polyurethane Foam for Pipeline Pigs qualitatively. EPA determined that the daily rate of the release of DIBP from each of the various sources of release of this OES is less than the daily rate of the release of DIBP from a corresponding source of release of the Plastics compounding OES, Plastics converting OES, or Rubber manufacturing OES. The MOEs for COUs associated with these OESs were well above the benchmark MOE of 30 and therefore, EPA is preliminarily determining that this COU (*i.e.*, pipeline pigs) also does not contribute to the unreasonable risk to DIBP.

6.1.5 Consumers

Based on the consumer risk estimates and related risk factors, EPA is preliminarily determining that DIBP does not present unreasonable risk of injury to human health for consumers under any COUs.

For the DIBP individual analysis, EPA assessed consumer risk from inhalation, ingestion, and dermal exposures, as well as aggregated exposure for various exposure scenarios involving DIBP-containing products and articles across consumer COUs. The consumer and bystander populations assessed were infants (<1 year), toddlers (1–2 years), preschoolers (3–5 years), middle childhood (6–10 years), young

teens (11–15 years), teenagers (16–20 years), and adults (21+ years). The suitability of the exposure intensity scenarios depended on the various exposure assumptions or uncertainties (as discussed in more detail below for 2 COUs). Additional information about the individual consumer analysis is provided in Section 4.4.3 of this risk evaluation.

For the DIBP draft RPF analysis, the risk estimates were recalculated using the draft RPF and the application of the index chemical POD to provide a more sensitive and robust hazard assessment. The RPF analysis specifically focused on acute exposure as there is evidence that effects on the developing male reproductive system can result from a single exposure during the critical window of development. These risk estimates based on the draft RPF and POD scaling (to the index chemical) were then combined with cumulative non-attributable exposure of five toxicologically similar phthalates (*i.e.*, DEHP, DBP, BBP, DIBP, and DINP as estimated from NHANES biomonitoring data). EPA focused its overall consumer CRA on females of reproductive age and male infants and children, as these populations and the acute exposure duration are considered the most directly applicable to the common hazard outcome that serves as the basis for the draft RPF analysis (*i.e.*, reduced fetal testicular testosterone). More information about the draft RPF analysis and cumulative non-attributable exposures is provided in Section 4.4.3 of this risk evaluation.

Two consumer COUs had MOEs suggesting unreasonable risk, but EPA preliminarily determined that they do not contribute to unreasonable risk for the reasons discussed below.

First, the COU Consumer use – fabric, textile, and leather products not covered elsewhere – (*e.g.*, textile [fabric] dyes), had an MOE just below the benchmark of 30 (28) for the high intensity exposure scenario (within the draft RPF analysis) based on acute dermal exposure of infants, but EPA is preliminarily determining that it does not present unreasonable risk.

Four different article scenarios were assessed for the Fabric, textile and leather products not covered elsewhere COU: (1) children’s clothing, (2) synthetic leather clothing, (3) textile furniture components, and (4) small articles with potential for semi-routine contact. For the article scenario of children’s clothing specifically, EPA considered the high intensity exposure scenario because the 8-hour exposure duration in that scenario is expected for the types of children’s clothing being evaluated, as discussed below and in Section 4.3.3. EPA has robust confidence that the various use scenario inputs accurately represent expected uses. For the high intensity exposure scenario for children’s clothing, the contact area corresponds to 50 percent of the body, in comparison to 25 percent of the face, hands, and arms for the medium-intensity use scenario. Additionally, the duration was between 480 minutes (8 hours) and 240 minutes (4 hours) for the high and medium scenarios respectively, over 1 day for acute and 365 days for chronic exposure.

EPA identified that children’s clothing items containing DIBP included bodysuits, tops, bottoms and underwear—all of which are likely to be used for 8 hours or more, though young children can change clothes often during the day and not necessarily wear the same type of clothing. This can result in shorter periods of exposure represented in the medium-intensity use scenario. DIBP was also associated with various components, including inks/dyes/pigments, synthetic polymers, bio-based materials, and textiles ([WSDE, 2020](#)). Any increases in duration or skin contact from the assumed 50 percent and 480 minutes (8 hours) would result in MOEs that are smaller than what is already captured at the high-intensity exposure scenario. The types of clothing items identified for this article scenario and the expected uses of those clothing items align with the assumptions about exposure such as contact area, duration and days used in the high intensity use scenario. In contrast, the medium-intensity scenario for children’s clothing better represents items similar to raincoats and accessories which are assumed to

have lower contact area, duration and/or days used. While infants had an MOE of 40 for the individual DIBP analysis, the MOE is 28 when applying the draft RPF analysis (and an MOE of 24 including the non-attributable cumulative exposure from NHANES). Note that because relative potency factors are based on reduced fetal testicular testosterone, EPA considers the most directly applicable populations for the draft RPF analysis to be pregnant women, females of reproductive age, and male infants and male children (in this case the lifestage of infants).

The draft RPF analysis provides a robust basis for assessing the dose-response for the common hazard endpoint (*i.e.*, reduced fetal testicular testosterone) across the six toxicologically similar phthalates, including DIBP. A more thorough discussion of the relationship between the individual and RPF approaches is found in Section 4.4.1. Use of meta-analysis and BMD modeling allowed EPA to utilize more fetal testicular testosterone data in the low-end range of the dose-response curve (*i.e.*, where a 5% response was observed)—particularly for the index chemical, DBP. For DIBP, the analysis integrated fetal testicular testosterone data from three gestational exposure studies of rats, all of which reported data above and below the 40 percent response level where the RPF for DIBP was derived. Comparatively, the DIBP-specific POD used in the individual chemical assessment is based on BMD modeling of data from a single study, and the BMDL₅ estimate that is the basis of the POD is below the lowest dose with empirical data that was evaluated in the study. Given DIBP's limited toxicological dataset, scaling by the draft RPF and application of the index chemical POD provides a more sensitive and robust dose-response assessment than the DIBP-specific point of departure (POD). Overall, EPA has robust confidence in the draft RPFs and index chemical (DBP) POD used to calculate the draft RPF analysis and cumulative MOEs.

However, there is uncertainty with respect to the modeling of dermal absorption of DIBP from solid matrices or articles, as discussed in Section 4.3.3. The flux-limited dermal absorption screening approaches for liquid and solid products and articles assumes a constant rate of absorption of DIBP in contact with the skin. The selected absorptive flux is most representative of dermal absorption to DIBP from liquid compounds. Because it is expected that absorption of DIBP from solid materials will not exceed the rate of absorption of DIBP from liquid materials, the dermal exposure estimates represent the expected levels of consumer dermal exposure for contact with liquid materials and upper-bound estimates for contact with solid materials. This likely results in some overestimations for solid articles and is more representative for liquid products because for solid articles it is assumed that there is a lower rate of dermal absorption than for liquid materials due to reduced mobility of molecules within a solid matrix. Based on the available *in vitro* dermal absorption data for DBP ([Scott et al., 1987](#)), which is used as a surrogate for DIBP due to chemical similarities, there is moderate confidence in the estimated rate of absorption from liquid materials containing DIBP. When considering uncertainties from using the liquid product flux for solids, there is slight to moderate confidence that the estimated rate of absorption for DIBP serves as an upper-bound for the absorption of a solid material.

As a result, EPA is preliminarily concluding that this COU (Consumer use – fabric, textile, and leather products not covered elsewhere – fabric, textile, and leather products not covered elsewhere [*e.g.*, textile (fabric) dyes]) does not present unreasonable risk to infants given the conservative nature and the uncertainty surrounding the modeling of the dermal absorption of DIBP from solid matrices or articles. In addition, the risk estimate is above the benchmark MOE of 30 (40) when considering the high intensity scenario from the individual analysis and only slightly below the benchmark of 30 (28) when considering the high-intensity scenario from the RPF analysis.

Second, the COU Consumer use – Floor coverings – Floor coverings, has MOEs below the benchmark of 30 (24–29) for the high intensity exposure scenario (within the individual analysis) based on acute

and chronic inhalation exposure, but EPA is preliminarily determining that it does not significantly contribute to unreasonable risk. When considering the medium intensity exposure, EPA's floor analysis resulted in MOEs that were greater than the benchmark MOE of 30 for acute and chronic inhalation (as well as aggregate). When considering the high intensity use scenario, one of the two different article scenarios assessed (the vinyl flooring scenario) resulted in MOEs below the benchmark of 30; that is, 24 to 29 for the individual analysis for acute and chronic inhalation exposure and 15 to 28 for the draft RPF analyses and non-attributable cumulative exposure from NHANES for acute inhalation exposure. However, the high-intensity exposure scenario assumed that the entirety of the house flooring contained DIBP, that the vinyl flooring contained the maximum reported value of 7.4 percent DIBP, and that exposed children spent 20 hours per day in the home. Although this scenario is possible, EPA is uncertain of the widespread confluence of these factors. The medium-and low-intensity use scenarios allow for the presence of other floor coverings in addition to vinyl flooring (50 and 25% of floor coverage respectively) and flooring with lower weight fractions of DIBP, which may be a better representation of average U.S. homes. When considering the medium intensity scenario from both the individual and the draft RPF analyses, the risk estimates are above the benchmark MOE. Thus, EPA is preliminarily concluding that this COU does not significantly contribute to unreasonable risk.

Overall, EPA has moderate and robust confidence in the assessed inhalation, ingestion, and dermal consumer exposure scenarios, and robust confidence in the non-cancer PODs selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP. The exposure doses used to estimate risk relied on conservative, health-protective inputs and parameters that are considered representative of a wide selection of use patterns. Overall, EPA has moderate to robust confidence in the risk estimates calculated for consumers inhalation, ingestion, and dermal exposure scenarios. Further information on EPA's confidence in these risk estimates and the uncertainties associated with them can be found in this draft risk evaluation as well as the *Draft Consumer and Indoor Dust Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025d](#)).

In addition, EPA has robust confidence in the draft RPFs and index chemical (DBP) POD used to calculate the draft RPF analysis and cumulative MOEs as well as in the derived estimates of non-attributable cumulative exposure from NHANES urinary biomonitoring using reverse dosimetry. More information on EPA's confidence in the draft RPF analysis' risk estimates and the uncertainties associated with them can be found in *Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) under the Toxic Substances Control Act (TSCA)* ([U.S. EPA, 2024h](#)).

6.1.6 General Population

Based on the risk estimates, EPA did not identify risk to the general population from the following exposure routes and pathways for DIBP:

- exposure via the land pathway (*i.e.*, application of biosolids and landfills);
- incidental ingestion and dermal contact from swimming;
- acute and chronic ingestion of drinking water;
- acute and chronic ingestion exposure from fish ingestion;
- acute and chronic inhalation exposure to ambient air in proximity to releasing facilities, including fenceline communities; and
- soil ingestion exposure from air deposition to soil.

As stated in Section 4.3.4, EPA evaluated surface water, drinking water, fish ingestion, and ambient air pathways quantitatively using a screening level approach for DIBP releases associated with COUs (see the *Draft Environmental Media, General Population, and Environmental Exposure Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)) and Section 4.1.3 for additional details about the assessment and assessment process). Land pathways (*i.e.*, landfills and application of biosolids) were assessed qualitatively, and were inclusive of down-the-drain releases of consumer products and landfill disposal of consumer articles (see Section 3.1.3 for details on the qualitative assessment of consumer disposal of DIBP-containing products and articles). For pathways assessed quantitatively, high-end estimates of DIBP concentration in the various environmental media were used for screening level purposes. EPA used an MOE approach using high-end exposure estimates to determine whether an exposure pathway had potential non-cancer risks. High-end exposure estimates were defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations. Therefore, if there is no risk for an individual identified as having the potential for the highest exposure associated with a COU for a given pathway of exposure, then that pathway was determined not to be a pathway of concern and not pursued further. Based on the screening level approach described in Section 4.1.3 and the qualitative assessment of landfill and biosolids pathways described in Section 3.1.3, EPA did not identify unreasonable risk to the general population from exposure to DIBP through biosolids, landfills, surface water, drinking water, fish ingestion, and ambient air for any COU listed in Table 3-1.

EPA has moderate to robust confidence that the risk estimates calculated for the general population were conservative and appropriate for a screening level analysis. EPA also has robust confidence that modeled releases used are appropriately conservative for a screening level analysis. Therefore, the Agency has robust confidence that no exposure scenarios will lead to greater doses than presented in this draft risk evaluation. Furthermore, many of the acute dose rates or average daily doses from a single exposure scenario exceed the total daily intake values estimated in Section 4.1.3.2 using NHANES data, adding further confidence that the exposure estimates captured high-end exposure scenarios and were appropriately conservative.

6.2 Environment

Based on the environmental assessment, EPA is preliminarily determining that DIBP presents unreasonable risk of injury to the environment due to chronic exposure from direct discharge to surface water from four COUs:

- Processing – incorporation into formulation, mixture, or reaction product – plasticizers (plastic product manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paints and coatings);
- Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and
- Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production).

As shown in Section 5.3.2, the RQ values were calculated for surface water exposures from the 15 COUs with quantitative estimates. For environmental pathways and COUs that were quantitatively assessed, EPA compared the release estimates to environmental media for a given pathway with the hazard values for aquatic and terrestrial organisms.

Calculated RQs can provide a risk profile by presenting a range of estimates for different environmental hazard effects for different COUs. An RQ equal to 1 indicates that the exposures are the same as the concentration that causes effects. An RQ less than 1, when the exposure is less than the effect concentration, generally indicates that there is not risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance. An RQ greater than (exceeding) 1, when the exposure is greater than the effect concentration, generally indicates that there is risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance.

EPA has qualitatively evaluated COUs without RQs by integrating limited amounts of reasonably available information using professional judgment of read-across evidence and is preliminarily determining they do not significantly contribute to the unreasonable risk to the environment. For all environmental pathways, eight COUs were preliminarily determined to not significantly contribute to the unreasonable risk based on a qualitative assessment of the Fabrication or use of final products or articles OES indicating that environmental releases are expected to be minimal and dispersed. Also, EPA has preliminarily determined that distribution in commerce does not contribute to unreasonable risk to the environment. Additionally, the Agency assessed the land pathway from biosolids and landfills qualitatively and is preliminarily determining that non-cancer risk from exposure to soil and water contaminated with DIBP migrating from biosolids and landfills does not contribute to unreasonable risk to the environment. The qualitative analyses are a best estimate of what EPA expects given the weight of scientific evidence without overstating the science. Further information about how COUs were assessed for risk to the environment is summarized in Table 5-1 and Table 5-2 of this draft risk evaluation.

6.2.1 Populations and Exposures EPA Assessed for the Environment

DIBP is expected to be released to the environment via air, water, biosolids, and disposal to landfills. It is expected to show strong affinity and sorption potential in organic carbon in soil and sediment, and when released to air, DIBP is expected to adsorb to particulate matter. In water, DIBP is expected to mostly partition to suspended organic matter and aquatic sediments ([U.S. EPA, 2025z](#)). However, DIBP is not expected to undergo long-range transport and is expected to be found predominantly in sediments near point sources. EPA conducted a quantitative analysis for risks of DIBP via surface water, sediment, and air deposition to soil. Because concentrations of DIBP in soil (biosolids, landfills) and air are limited or are not expected to be bioavailable, groundwater concentrations resulting from releases from landfills or from agricultural lands via biosolids applications were not quantified but are discussed qualitatively as discussed in Section 5.3.

EPA expects the main environmental exposure pathway to be to aquatic species from releases to surface water and subsequent deposition to sediment. Releases to ambient air and subsequent deposition to water and sediment also have a limited contribution to environmental exposure for aquatic organisms. Based on the water solubility and hydrophobicity of DIBP, it is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms. Therefore, DIBP has low potential for trophic transfer through food webs. As detailed in Section 5.2, concentrations of concern were derived for several aquatic receptors in surface water for DIBP, including acute and chronic exposures to aquatic vertebrates, aquatic invertebrates, and benthic invertebrates, and aquatic plants and algae. EPA's risk characterization indicated risk based on chronic risk from surface water to aquatic vertebrates and aquatic and benthic invertebrates, as discussed in Sections 6.2.2 and 6.2.3.

Of the COUs with calculated RQs, EPA is preliminarily determining that three COUs associated with the Plastic compounding OES and one COU associated with the Use as a catalyst OES significantly

contribute to the unreasonable risk of injury to the environment based on chronic exposure to surface water. These are list below:

- Processing – incorporation into formulation, mixture, or reaction product – plasticizer (plastic product manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and
- Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production).

Due to the lack of reasonably available release data for facilities discharging DIBP to surface waters, releases were modeled, and the high-end estimate for each COU was applied for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant NAICS codes and that had NPDES permits. EPA has slight to moderate confidence in the modeled concentrations' being representative of actual releases, with a slight bias toward over-estimation when pairing lower flow rates with higher releases and assuming no wastewater treatment. Additionally, EPA has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation based on the conservative assumptions used.

6.2.2 Summary of Environmental Effects

EPA is preliminarily determining that four COUs associated with the Plastic compounding OES— Processing – incorporation into formulation, mixture, or reaction product – plasticizer (plastic product manufacturing); Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing); Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed) and one COU associated with the Use as a catalyst OES (Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing [*e.g.*, catalyst component for polyolefins production])—significantly contribute to unreasonable risk to the environment from DIBP due to the following chronic effects:

- For mortality, growth, reproduction, and development for aquatic vertebrates and invertebrates.

EPA has robust confidence that DIBP has chronic effects on aquatic vertebrates and invertebrates in the environment due to the use of analog data. Because no aquatic chronic studies were reasonably available for the quantitative assessment of potential hazards from DIBP exposure, a read-across was conducted using DBP (U.S. EPA, 2024a). The robust confidence in DIBP is supported by the quality and consistency of the analog DBP chronic aquatic vertebrate, invertebrate, and benthic invertebrate database. Further information about EPA's confidence in the aquatic, terrestrial, and trophic transfer hazard assessments is provided in Section 5.3.4 of this draft risk evaluation.

6.2.3 Basis for Unreasonable Risk of Injury to the Environment

Based on the draft risk evaluation for DIBP—including the risk estimates, the environmental effects of DIBP, the exposures, physical and chemical properties of DIBP, and consideration of uncertainties— EPA is preliminarily determining that DIBP significantly contributes to unreasonable risk of injury to the environment based on chronic exposure to surface water associated with four COUs (Processing – incorporation into formulation, mixture, or reaction product – plasticizer [plastic product manufacturing]; Processing – incorporation into formulation, mixture, or reaction product – solvents

[which become part of product formulations or mixture] [plastic material and resin manufacturing]; Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing [e.g., catalyst component for polyolefins production]). Consistent with EPA’s determination of unreasonable risk to human health, the RQ is not treated as a “bright line” and other risk-based factors may be considered (e.g., confidence in the hazard and exposure characterization, duration, magnitude, uncertainty) for purposes of making an unreasonable risk determination. The overall environmental risk characterization confidence levels varied and are summarized in the *Draft Environmental Media and General Population and Environmental Exposure Assessment for Diisobutyl Phthalate (DIBP)* ([U.S. EPA, 2025s](#)).

For the surface water pathway, EPA conducted modeling to assess the expected resulting surface water concentrations from the COUs. The modeled releases were evaluated for resulting environmental media concentrations at the point of discharge (i.e., in the immediate receiving water body receiving the effluent). Modeled releases were assumed to be released to surface water with treatment, unless the type of discharge (Table 3-6) indicated that it may go direct to surface water (i.e., 5 COUs). For these five COUs (i.e., Processing – incorporation into formulation, mixture, or reaction product – plasticizers [plastic product manufacturing]; Processing – incorporation into formulation, mixture, or reaction product – solvents [which become part of product formulations or mixture] [plastic material and resin manufacturing; paints and coatings]; Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; Processing – incorporation into formulation, mixture, or reaction product – plastic and rubber products not covered elsewhere; and Processing – incorporation into an article – plasticizers [plastic product manufacturing; transportation equipment manufacturing]), water concentrations are also reported without wastewater removal treatment and EPA’s preliminary risk determination is based on direct release without treatment.

Due to the partitioning of the compound to sediment, wastewater treatment is expected to be moderately effective at removing DIBP from the water column prior to discharge, and therefore EPA estimated risk treated effluent showing a wastewater treatment removal efficiency of 68 percent. In addition, without TRI and DMR data, EPA cannot identify the receiving water bodies and their location-specific hydrological flow data. In lieu of facility-specific receiving water body information for DIBP, flow statistics were drawn from a generic distribution of receiving water body flow rates derived from receiving water bodies listed on NPDES permits for facilities with relevant NAICS codes (see Section 3.3). Due to especially limited information regarding release locations, a single pooled distribution of receiving water bodies was applied across each COU (Section 3.3). Hydrologic flow data were categorized into percentiles, and 50th percentile flow (P50) (36,950 m³/day), 75th percentile flow (P75) (634,500 m³/day), and 90th percentile flow (P90) (10,740,000 m³/day) were modeled. The Agency expects high-end releases to discharge to surface waters with higher flow conditions (e.g., P75 and P90).

Of the COUs with calculated RQs, EPA is preliminarily determining that three COUs associated with the Plastic compounding OES and one COU associated with the Use as a Catalyst OES significantly contribute to the unreasonable risk of injury to the environment based on chronic exposure to surface water:

- Processing – incorporation into formulation, mixture, or reaction product – plasticizer (plastic product manufacturing);
- Processing – incorporation into formulation, mixture, or reaction product – solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing);

- Processing – incorporation into formulation, mixture, or reaction product – processing aids, not otherwise listed; and
- Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production).

EPA's preliminary risk determination for the three COUs associated with the Plastic compounding OES is based on the risk estimates without treatment and a medium flow rate of P75 (634,500 m³/day). As previously mentioned, without direct evidence that supports wastewater treatment occurring in lieu of direct to surface water release, the Agency assessed releases for both (with and without treatment) scenarios. EPA welcomes public comment on this approach and seeks available information to inform what scenarios represent current practices. RQs exceeded 1 for both central tendency (1.72) and high-end (8.52) release estimates. When wastewater treatment is applied (*e.g.*, on-site treatment or discharge to POTW) the RQ remains above 1 for the high-end release scenario (2.73). It is important to note that the Plastic compounding OES had releases associated with multiple media types (wastewater to onsite treatment, discharge to POTW [with or without pretreatment], direct to surface water, incineration, or landfill), but also had releases categorized specifically to water (wastewater to onsite treatment, discharge to POTW [with or without pretreatment]). EPA estimated surface water concentrations for Plastic compounding OES using the releases categorized specifically to water and did not consider the releases associated with the multiple media types that could have resulted in an underestimation of risk. Additionally, there is uncertainty in the representativeness of estimated release values toward the true distribution of potential releases at all sites for the use. There is also uncertainty in the representativeness of generic flow scenarios of actual releases from real-world sites that compound DIBP into plastic resin ([U.S. EPA, 2025s](#)). EPA has slight to moderate confidence in the modeled concentrations as being representative of actual releases, with a minor bias toward over-estimation. EPA has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation due to the conservative assumptions used.

For nine COUs, the modeled generic scenarios did not distinguish the amount or type of discharge (*i.e.*, landfill, incineration, or surface water) therefore, other lines of evidence were evaluated for each of these OESs individually to better inform the modeled surface water concentrations (Section 5.3.1). After additional refinements, one of these nine COUs—Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)—was found to significantly contribute to the unreasonable risk. EPA's preliminary determination of unreasonable risk for this COU is informed by existing facility release data that support the use of one of EPA's modeled scenarios (*i.e.*, 1,045 kg/site/yr release with a medium flow rate of P75 [634,500 m³/day] resulting in an RQ of 4.21).

For the remaining eight COUs (*i.e.*, Manufacturing – import; Processing – as a reactant – intermediate [plastic manufacturing]; Processing – repackaging; Industrial use – paints and coatings; Industrial use – adhesives and sealants; Commercial use – paints and coatings; Commercial use – adhesives and sealants; and Commercial use – laboratory chemicals) EPA is preliminarily determining that they do not significantly contribute to the unreasonable risk. Processing – Repackaging; Industrial use – Paints and Coatings; Industrial use – Adhesives and sealants; Commercial use – Paints and Coatings; Commercial use – Adhesives and sealants; and Commercial use – Laboratory chemicals) EPA is preliminarily determining that they do not significantly contribute to the unreasonable risk. Three COUs (*i.e.*, Processing – as a reactant – intermediate [plastic manufacturing]; Industrial use – adhesives and sealants; and Commercial use – adhesives and sealants) resulted in RQs well below 1—even when assuming 100 percent release to wastewater and a P75 flow rate. Two COUs (*i.e.*, Industrial use – paints and coatings; and Commercial use – paints and coatings) have reasonably available evidence supporting

the use of wastewater treatment removal and based on the application of wastewater treatment, 100 percent release to surface water, and a P75 flow, no risk was indicated. For two other COUs (*i.e.*, Manufacturing – import; and Processing – repackaging), EPA compared actual release data from DBP, in the absence of reasonable release data for DIBP, which resulted in concentrations significantly lower than generic modeled concentrations for DIBP and no RQs exceeding 1 at any flow metric. Lastly, for the Commercial use – laboratory chemicals COU, no facility-specific data was available for DIBP or DBP. With conservative inputs for the modeled scenario (*i.e.*, no wastewater treatment and assuming 100% release to surface water) the RQ is 1.99 for central tendency estimates. EPA has slight confidence in these calculated RQs for this COU and expects it to be an overestimate of risk. Therefore, EPA is also preliminarily determining that the Commercial use – laboratory chemicals COU does not contribute to the unreasonable risk of injury to the environment from DIBP.

Additionally, EPA evaluated activities resulting in exposures associated with distribution in commerce throughout the various life cycle stages and COUs (*e.g.*, Manufacturing, Processing, Industrial Use, Commercial Use, Disposal) rather than a single distribution scenario. The Agency expects that environmental releases from distribution in commerce will be similar to or less than the exposure estimates from COUs evaluated that did not indicate hazard to ecological receptors. EPA also expects all the DIBP or DIBP-containing products and/or articles to be transported in closed system or otherwise to be transported in a form (*e.g.*, articles containing DIBP) such that there is negligible potential for releases. Therefore, no separate assessment was performed for estimating releases and exposures from distribution in commerce.

EPA evaluated down-the-drain releases of DIBP for consumer COUs qualitatively. Although the Agency acknowledges that there may be DIBP releases to the environment via the cleaning and disposal of adhesives, sealants, paints, lacquers, and coatings, EPA did not quantitatively assess down-the-drain and disposal scenarios of consumer products due to limited reasonably available information from monitoring data or modeling tools. However, the consideration of the physical and chemical properties of DIBP allows the Agency to conduct a qualitative assessment. DIBP's affinity to organic material (log K_{OW}) and low water solubility suggest that DIBP in down-the-drain water is expected to mainly partition to suspended solids present in water. Also, the use of flocculants and filtering media could potentially help remove DIBP during conventional drinking water treatment. Therefore, EPA is preliminarily determining that environmental exposures from down-the-drain releases associated with the consumer COUs do not contribute to unreasonable risk.

6.3 Additional Information Regarding the Basis for the Risk Determination

Table 6-1 and Table 6-2 summarize the basis for this preliminary unreasonable risk determination of injury to human health and the environment presented in this DIBP risk evaluation. In Table 6-1, bold text indicates that an MOE is below the benchmark value. Table 6-1 identifies the duration of exposure (*e.g.*, acute, intermediate, chronic duration) and the exposure route to the population or receptor. As explained in Section 6.2, for this preliminary unreasonable risk determination, EPA has considered the effects of DIBP to human health and the environment, including PESS, as well as a range of risk estimates as appropriate, risk-related factors, and the confidence in the analysis. See Sections 4.3 and 5.3 for a summary of risk estimates.

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Table 6-1. Supporting Basis for the Preliminary Unreasonable Risk Determination for Human Health (Occupational COUs)

COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Manufacturing	Domestic manufacturing	Manufacturing	Average Adult Worker	CT	11,400	15,545	16,644	1,522	2,075	2,222	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,073	15,068	1,657	2,259	2,419	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,545	16,644	^b	^b	^b	N/A	N/A
	Import	Import and repackaging	Average Adult Worker	CT	11,400	15,546	20,005	1,522	2,075	2,671	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,074	18,111	1,657	2,259	2,907	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,546	16,644	^b	^b	^b	N/A	N/A
Processing – Incorporation into article	Plasticizer (plastic product manufacturing; transportation equipment manufacturing)	Plastics converting	Average Adult Worker	CT	2,171	2,961	3,619	1,522	2,075	2,537	N/A	N/A
				HE	124	169	181	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	1,966	2,681	3,276	1,657	2,259	2,761	N/A	N/A
				HE	112	153	164	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	2,171	2,961	3,619	3,044	4,151	5,073	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Processing – Incorporation into formulation, mixture, or reaction product	Plasticizers (adhesives manufacturing; plastic product manufacturing)	Incorporation into adhesives and sealants	Average Adult Worker	CT	11,400	15,546	16,644	1,522	2,075	2,222	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,074	15,068	1,657	2,259	2,419	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,546	16,644	^b	^b	^b	N/A	N/A
		Plastic compounding	Average Adult Worker	CT	10,873	14,826	17,796	1,522	2,075	2,491	N/A	N/A
				HE	2,171	2,961	3,170	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	9,843	13,423	16,111	1,657	2,259	2,711	N/A	N/A
				HE	1,966	2,681	2,870	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	10,873	14,826	15,874	3,044	4,151	4,982	N/A	N/A
Processing – Incorporation into formulation, mixture, or reaction product	Solvents (which becomes part of product formulations or mixture) (plastic material and resin manufacturing; paints and coatings)	Plastic compounding	Average Adult Worker	CT	10,873	14,826	17,796	1,522	2,075	2,491	N/A	N/A
				HE	2,171	2,961	3,170	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	9,843	13,423	16,111	1,657	2,259	2,711	N/A	N/A
				HE	1,966	2,681	2,870	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	10,873	14,826	15,874	3,044	4,151	4,982	N/A	N/A
		Incorporation into paints and coatings	Average Adult Worker	CT	11,400	15,546	16,644	1,522	2,075	2,222	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,074	15,068	1,657	2,259	2,419	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,546	16,644	^b	^b	^b	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Processing – Incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed	Plastic compounding	Average Adult Worker	CT	10,873	14,826	17,796	1,522	2,075	2,491	N/A	N/A
				HE	2,171	2,961	3,170	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	9,843	13,423	16,111	1,657	2,259	2,711	N/A	N/A
				HE	1,966	2,681	2,870	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	10,873	14,826	15,874	3,044	4,151	4,748	N/A	N/A
Processing – Incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber compounding	Average Adult Worker	CT	456	622	711	1,522	2,075	2,374	N/A	N/A
				HE	45	61	65	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	413	563	644	1,657	2,259	2,584	N/A	N/A
				HE	41	55	59	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	456	622	711	3,044	4,151	4,748	N/A	N/A
		Rubber converting	Average Adult Worker	CT	912	1,244	1,520	1,522	2,075	2,537	N/A	N/A
				HE	48	65	70	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	826	1,126	1,376	1,657	2,259	2,761	N/A	N/A
				HE	43	59	63	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	912	1,244	1,520	3,044	4,151	5,073	N/A	N/A
Processing – Incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (e.g., catalyst component for polyolefins production)	Formulation into pre-catalyst	Average Adult Worker	CT	11,400	15,546	16,644	1,522	2,075	2,222	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,074	15,068	1,657	2,259	2,419	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,546	16,644	^b	^b	^b	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Processing as a reactant	Intermediate (plastic manufacturing)	Intermediate in polypropylene manufacturing	Average Adult Worker	CT	11,399	15,543	16,641	1,522	2,075	2,222	N/A	N/A
				HE	2,491	3,397	3,637	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,319	14,071	15,066	1,657	2,259	2,419	N/A	N/A
				HE	2,255	3,075	3,292	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,398	15,543	16,641	3,044	4,151	4,444	N/A	N/A
Processing	Repackaging (e.g., laboratory chemicals)	Import and repackaging	Average Adult Worker	CT	11,400	15,545	20,005	1,522	2,075	2,671	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,073	18,111	1,657	2,259	2,907	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,545	16,644	^b	^b	^b	N/A	N/A
Processing	Recycling	Recycling	Average Adult Worker	CT	877	1,196	1,435	1,522	2,075	2,491	N/A	N/A
				HE	64	87	93	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	794	1,083	1,299	1,657	2,259	2,711	N/A	N/A
				HE	58	78	84	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	877	1,196	1,435	3,044	4,151	4,982	N/A	N/A
Industrial use – fam	Pipeline pigs	Manufacture of polyurethane foam for pipeline pigs	Average Adult Worker	CT	^c	^c	^c	^c	^c	^c	N/A	N/A
				HE	^c	^c	^c	^c	^c	^c	N/A	N/A
			Females of Reproductive Age	CT	^c	^c	^c	^c	^c	^c	N/A	N/A
				HE	^c	^c	^c	^c	^c	^c	N/A	N/A
			ONU	CT ^a	^c	^c	^c	^c	^c	^c	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Industrial – Commercial use	Paints and coatings	Application of paints and coatings – spray application	Average Adult Worker	CT	135	184	197	1,522	2,075	2,222	N/A	N/A
				HE	2.1	2.8	3.0	761	1,038	1,111	52	25
			Females of Reproductive Age	CT	122	167	178	1,657	2,259	2,419	N/A	N/A
				HE	1.9	2.5	2.7	828	1,129	1,209	47	25
			ONU	CT ^a	135	184	197	3,044	4,151	4,444	N/A	N/A
		Application of paints and coatings – non spray application	Average Adult Worker	CT	11,400	15,546	16,644	1,522	2,075	2,222	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,074	15,068	1,657	2,259	2,419	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,546	16,644	^b	^b	^b	N/A	N/A
Industrial – Commercial use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Average Adult Worker	CT	1,140	1,555	1,664	1,522	2,075	2,222	N/A	N/A
				HE	127	173	185	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	1,032	1,407	1,507	1,657	2,259	2,419	N/A	N/A
				HE	115	156	167	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	1,140	1,555	1,664	3,044	4,151	4,444	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Industrial – Commercial use	Adhesives and sealants	Application of adhesives and sealants – spray application	Average Adult Worker	CT	22	31	35	1,522	2,075	2,395	225	10
				HE	2.1	2.8	3.0	761	1,038	1,111	52	25
			Females of Reproductive Age	CT	20	28	32	1,657	2,259	2,606	203	10
				HE	1.9	2.5	2.7	828	1,129	1,209	47	25
			ONU	CT ^a	22	31	35	3,044	4,151	4,789	N/A	N/A
		Application of adhesives and sealants – non spray application	Average Adult Worker	CT	11,400	15,545	17,935	1,522	2,075	2,395	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,073	16,267	1,657	2,259	2,606	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,545	17,935	^b	^b	^b	N/A	N/A
Commercial Use	Laboratory chemicals	Use of laboratory chemicals (liquids)	Average Adult Worker	CT	11,400	15,545	17,706	1,522	2,075	2,364	N/A	N/A
				HE	2,492	3,398	3,638	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	10,321	14,073	16,030	1,657	2,259	2,573	N/A	N/A
				HE	2,256	3,076	3,294	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	11,400	15,545	17,706	^b	^b	^b	N/A	N/A
		Use of laboratory chemicals (solids)	Average Adult Worker	CT	240,000	327,27	372,766	1,522	2,075	2,364	N/A	N/A
				HE	16,889	23,030	24,658	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	217,275	296,284	337,470	1,657	2,259	2,573	N/A	N/A
				HE	15,290	20,850	22,323	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	240,000	327,273	372,766	3,044	4,151	4,728	N/A	N/A

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COU		OES	Worker Population	Exposure Level	Inhalation Risk Estimates			Dermal Risk Estimates			Acute Inhalation Exposure	
Life Cycle Stage – Category	Subcategory				(Benchmark MOE = 30)			(Benchmark MOE = 30)			(Benchmark MOE = 30)	
					Acute	Inter.	Chronic	Acute	Inter.	Chronic	Worker MOE with PPE ^d	APF ^d
Commercial Use	Toys, playground, and sporting equipment	Fabrication or use of final products and articles	Average Adult Worker	CT	1,140	1,555	1,664	1,522	2,075	2,222	N/A	N/A
				HE	127	173	185	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	1,032	1,407	1,507	1,657	2,259	2,419	N/A	N/A
				HE	115	156	167	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	1,140	1,555	1,664	3,044	4,151	4,444	N/A	N/A
Disposal	Disposal	Waste handling, treatment, and disposal	Average Adult Worker	CT	877	1,196	1,435	1,522	2,075	2,491	N/A	N/A
				HE	64	87	93	761	1,038	1,111	N/A	N/A
			Females of Reproductive Age	CT	794	1,083	1,299	1,657	2,259	2,711	N/A	N/A
				HE	58	78	84	828	1,129	1,209	N/A	N/A
			ONU	CT ^a	877	1,196	1,435	3,044	4,151	4,982	N/A	N/A
APF = assigned protection factor; CT = central tendency; HE = high-end; MOE = margin of exposure; OES = occupational exposure scenario; PPE = personal protective equipment												
^a In the absence of ONU exposure data, EPA used worker data as analogous data for ONU exposure. The inhalation MOEs for ONUs are equal to worker central tendency exposures MOEs. Dermal exposures to ONUs are represented by incidental skin contact equal to the surface area of one palm.												
^b ONUs were not assessed for dermal risk in this scenario.												
^c EPA assessed worker and ONU inhalation exposures in the case of the Manufacture of polyurethane foam for pipeline pigs COU qualitatively, and therefore numerical estimates are not included in this table. The Agency assessed this COU qualitatively by determining that the daily rate of the release of DIBP from each of the various sources of release of this COU is less than the daily rate of the release of DIBP from a corresponding source of release of the Plastics compounding OES, Plastics converting OES, or Rubber manufacturing OES.												
^d As available, PPE with the least amount of APF that could be used to bring acute inhalation exposure MOE values for any worker population above the benchmark MOE of 30 are shown in the table with corresponding MOE values, for more information please see Table 4-15 in Section 4.3.2.3 of this document.												
The <i>Draft Occupational Risk Calculator for Diisobutyl Phthalate (DIBP)</i> (U.S. EPA, 2025y) contains MOE calculations and PPE information for all the OES for all durations (acute, intermediate, and chronic).												

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Table 6-2. Supporting Basis for the Preliminary Unreasonable Risk Determination for the Environment

COU			Population/ Receptor	Compartment	Environmental Chronic Risk Quotient (RQ)
Lifecycle Stage	Category	Subcategory			
Processing	Incorporation into formulation, mixture, or reaction product	Plasticizers (plastic product manufacturing)	Aquatic	Surface water	1.72
Processing	Incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paints and coatings)	Aquatic	Surface water	1.72
Processing	Incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed	Aquatic	Surface water	1.72
Processing	Incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (e.g., catalyst component for polyolefins production)	Aquatic	Surface water	4.21

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APPENDICES

Appendix A KEY ABBREVIATIONS AND ACRONYMS

ADD	Average daily dose
ADC	Average daily concentration
APF	Assigned protection factor
BBP	Butyl benzyl phthalate
BLS	Bureau of Labor Statistics (U.S.)
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential business information
CDC	Centers for Disease Control and Prevention (U.S.)
CDR	Chemical Data Reporting
CEHD	Chemical Exposure Health Data
CEM	Consumer Exposure Model
CFR	Code of Federal Regulations
COC	Concentration of concern
CPSC	Consumer Product Safety Commission (U.S.)
CRA	Cumulative risk assessment
DBP	Dibutyl phthalate
DCHP	Dicyclohexyl phthalate
DEHP	Diethylhexyl phthalate
DIBP	Diisobutyl phthalate
DIDP	Diisodecyl phthalate
DINP	Diisononyl phthalate
DIY	Do-it-yourself
EPA	Environmental Protection Agency (U.S.)
ESD	Emission scenario document
EU	European Union
FDA	Food and Drug Administration (U.S.)
GS	Generic Scenario
K _{OC}	Soil organic carbon: water partitioning coefficient
K _{OW}	Octanol: water partition coefficient
HEC	Human equivalent concentration
HED	Human equivalent dose
IMDS	International Material Data System
IADD	Intermediate average daily dose
IR	Ingestion rate
LCD	Life cycle diagram
LOAEL	Lowest-observed-adverse-effect level
Log K _{OC}	Logarithmic organic carbon: water partition coefficient
Log K _{OW}	Logarithmic octanol: water partition coefficient
MOA	Mode of action
MOE	Margin of exposure
NAICS	North American Industry Classification System
NHANES	National Health and Nutrition Examination Survey
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NOAEL	No-observed-adverse-effect level
NPDES	National Pollutant Discharge Elimination System

5683	OCSPP	Office of Chemical Safety and Pollution Prevention (EPA)
5684	OECD	Organisation for Economic Co-operation and Development
5685	OES	Occupational exposure scenario
5686	OEV	Occupational exposure value
5687	ONU	Occupational non-user
5688	OPPT	Office of Pollution Prevention and Toxics (EPA)
5689	OSHA	Occupational Safety and Health Administration (U.S.)
5690	PBZ	Personal breathing zone
5691	PESS	Potentially exposed or susceptible subpopulations
5692	PND	Postnatal day
5693	PNOR	Particulates not otherwise regulated (model)
5694	POD	Point of departure
5695	PPE	Personal protective equipment
5696	PV	Production volume
5697	PVC	Polyvinyl chloride
5698	RPF	Relative potency factor
5699	RQ	Risk quotient
5700	SACC	Science Advisory Committee on Chemicals
5701	SDS	Safety data sheet
5702	SOC	Standard occupational classification
5703	SpERC	Specific emission release category
5704	TRI	Toxic Release Inventory
5705	TRV	Toxicity reference value
5706	TSCA	Toxic Substances Control Act
5707	TSD	Technical support document
5708	TWA	Time-weighted average
5709	UF	Uncertainty factor
5710	U.S.	United States
5711	VVWM-PSC	Variable Volume Water Model with Point Source Calculator tool
5712	w/w	Wet weight
5713	WWTP	Wastewater treatment plant
5714	7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
5715	30Q5	Lowest 30-day average flow that occurs (on average) once every 5 years

Appendix B REGULATORY AND ASSESSMENT HISTORY

B.1 Federal Laws and Regulations

Table_Apx B-1. Federal Laws and Regulations

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
EPA statutes/regulations		
Toxic Substances Control Act (TSCA) – section 6(b)	EPA is directed to identify high-priority chemical substances for risk evaluation; and conduct risk evaluations on at least 20 high priority substances no later than three and one-half years after the date of enactment of the Frank R. Lautenberg Chemical Safety for the 21st Century Act.	Diisobutyl phthalate is one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924 , December 30, 2019). Designation of diisobutyl phthalate as high-priority substance constitutes the initiation of the risk evaluation on the chemical substance.
TSCA – section 8(a)	The TSCA section 8(a) CDR rule requires manufacturers (including importers) to give EPA basic exposure-related information on the types, quantities and uses of chemical substances produced domestically and imported into the United States.	Di-isobutyl phthalate manufacturing (including importing), processing and use information is reported under the CDR rule (76 FR 50816 , August 16, 2011).
TSCA – section 8(b)	EPA must compile, keep current and publish a list (the TSCA Inventory) of each chemical substance manufactured (including imported) or processed in the United States.	Diisobutyl phthalate was on the initial TSCA Inventory and therefore was not subject to EPA’s new chemicals review process under TSCA section 5 (60 FR 16309 , March 29, 1995).
TSCA – section 8(d)	Provides EPA with authority to issue rules requiring producers, importers, and (if specified) processors of a chemical substance or mixture to submit lists and/or copies of ongoing and completed, unpublished health and safety studies.	Zero health and safety studies received for di-isobutyl phthalate (1982–1992) (U.S. EPA, ChemView. Accessed April 25, 2019). Di-isobutyl phthalate is listed under the category “Alkyl phthalates — all alkyl esters of 1,2-benzenedicarboxylic acid (ortho -phthalic acid)” (40 CFR 716.120).
TSCA – section 8(e)	Manufacturers (including importers), processors, and distributors must immediately notify EPA if they obtain information that supports the conclusion that a chemical substance or mixture presents a substantial risk of injury to health or the environment.	Two risk reports received for di-isobutyl phthalate (2003: 88030000106; 2010: 88100000438) (U.S. EPA, ChemView . Accessed April 9, 2019).
Clean Water Act (CWA) – sections 301, 304, 306, 307, and 402	CWA section 307(a) establishes a list of toxic pollutants or combination of pollutants under the CWA. The statute specifies a list of families of toxic pollutants also listed in the Code of Federal Regulations at 40 CFR	As a phthalate ester, di-isobutyl phthalate is designated as a toxic pollutant under section 307(a)(1) of the CWA, and as such is subject to effluent limitations. Specifically, di-isobutyl phthalate is

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	401.15. The “priority pollutants” specified by those families are listed in 40 CFR part 423 Appendix A. These are pollutants for which best available technology effluent limitations must be established on either a national basis through rules (sections 301(b), 304(b), 307(b), 306) or on a case-by-case best professional judgement basis in NPDES permits, see section 402(a)(1)(B). EPA identifies the best available technology that is economically achievable for that industry after considering statutorily prescribed factors and sets regulatory requirements based on the performance of that technology.	categorized as an “aromatic organic chemical,” as applicable to the process wastewater discharges resulting from the manufacture of bulk organic chemicals (40 CFR 414.70).
Other federal statutes/regulations		
Federal Food, Drug, and Cosmetic Act (FFDCA)	Provides the FDA with authority to oversee the safety of food, drugs and cosmetics.	Di-isobutyl phthalate is listed as an optional substance to be used in: adhesives to be used as components of articles intended for use in packaging, transporting, or holding food (21 CFR 175.105); the base sheet and coating of cellophane (21 CFR 177.1200).
Consumer Product Safety Improvement Act of 2008 (CPSIA)	Under section 108 of CPSIA, CPSC prohibits the manufacture for sale, offer for sale, distribution in commerce or importation of eight phthalates in toys and childcare articles at concentrations >0.1%: di-ethylhexyl phthalate, dibutyl phthalate, butyl benzyl phthalate, diisononyl phthalate, diisobutyl phthalate, di-n-pentyl phthalate, di-n-hexyl phthalate and dicyclohexyl phthalate.	The use of di-isobutyl phthalate at concentrations >0.1% is banned in toys and child care articles (16 CFR part 1307.3). Di-isobutyl phthalate is considered “toxic” under the FHSA. (CPSC Toxicity Review of di-isobutyl phthalate, Oct. 24, 2010). See also CPSC, Exposure Assessment: Potential for the Presence of Phthalates in Selected Plastics , October 1, 2015.

B.2 State Laws and Regulations

Table_Apx B-2. State Laws and Regulations

State Actions	Description of Action
State Water Pollution Discharge Programs	Several states have adopted water pollution discharge programs that categorize di-isobutyl phthalate as an “aromatic organic chemical,” as applicable to the process wastewater discharges resulting from the manufacture of bulk organic chemicals, including Illinois (35 Ill. Adm. Code 307-2406); and Wisconsin (Wis. Adm. Code § NR 235.60).
Chemicals of High Concern to Children	Several states have adopted reporting laws for chemicals in children’s products containing diisobutyl phthalate, including: Minnesota, which lists di-isobutyl phthalate as a “chemical of high concern” (Toxic Free Kids Act Minn. Stat. 116.9401 to 116.9407); and Washington State, which lists di-isobutyl phthalate as a “chemical of high concern to children” (Wash. Admin. Code 173-334-130).

State Actions	Description of Action
Other	Di-isobutyl phthalate is listed as a Candidate Chemical under California’s Safer Consumer Products Program established under Health and Safety Code § 25252 and 25253 (California, Candidate Chemicals List. Accessed April 17, 2019). Di-isobutyl phthalate is listed as a “nonfunctional constituent” under California’s Cleaning Product Right to Know Act of 2017 (California Health & Safety Code § 108952). California lists di-isobutyl phthalate as a designated priority chemical for biomonitoring under criteria established by California SB 1379 (Biomonitoring California, Priority Chemicals, February 2019).

B.3 International Laws and Regulations

Table_Apx B-3. International Laws and Regulations

Country/Tribe/ Organization	Requirements and Restrictions
Canada	Di-isobutyl phthalate is on the Domestic Substances List (Government of Canada. Managing substances in the environment. Substances search. Database accessed April 17, 2019).
European Union	In February 2012, di-isobutyl phthalate was added to Annex XIV of REACH (Authorisation List) with a sunset date of February 21, 2015. After the sunset date, only persons with approved authorization applications may continue to use the chemical. No requests for authorization were submitted by any user. There is a recommendation for amending the authorization list under review, with a deadline for commenting on December 3, 2019, which would revise the allowable concentration of the chemical for use in mixtures from 0.3–0.1% (European Chemicals Agency (ECHA) database. Accessed April 26, 2019). In March 2015, di-isobutyl phthalate was added to Annex II of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) (RoHS 2). The Directive sets a maximum concentration value tolerated by weight in homogenous materials for di-isobutyl phthalate of 0.1%. The restriction applies to medical devices, including <i>in vitro</i> medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021. The restriction does not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including <i>in vitro</i> medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021 (Commission Delegated Directive (EU) 2015/863). Di-isobutyl phthalate is subject to the Restriction of Hazardous Substances Directive (RoHS), EU/2015/863, which restricts the use of hazardous substances at more than 0.1% by weight at the “homogeneous material” level in electrical and electronic equipment, beginning July 22, 2019. (European Commission RoHS).
Australia	Di-isobutyl phthalate was assessed under Human Health Tier II of the Inventory Multi-Tiered Assessment and Prioritisation (IMAP) as part of the C4-6 side chain transitional phthalates. Uses reported include as a plasticizer for rubber and PVC, and in adhesives (NICNAS, 2016, Human Health Tier II assessment for C4-6 side chain transitional phthalates). In addition, di-isobutyl phthalate was assessed under Environment Tier II of IMAP as part of the phthalate esters.

Japan	Di-isobutyl phthalate is regulated in Japan under the following legislation: Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (Chemical Substances Control Law; CSCL) (National Institute of Technology and Evaluation (NITE) Chemical Risk Information Platform (CHRIP) . Accessed April 17, 2019).
World Health Organization (WHO)	WHO International Programme on Chemical Safety identified an acute hazard for di-isobutyl phthalate as combustible and recommended prevention and fire-fighting techniques (ICSC: 0829 , October 2006).
Denmark, Ireland, Latvia, New Zealand, South Africa, United Kingdom	Occupational exposure limits for diisobutyl phthalate (GESTIS International limit values for chemical agents [Occupational exposure limits, OELs]) database. Accessed February 12, 2025). Ireland, New Zealand, South Africa (mining), and the United Kingdom have an eight-hours limit of 5 mg/m ³ . Latvia has an 8-hour limit of 1 mg/m ³ . Denmark has an 8-hour limit of 3 mg/m ³ .

B.4 Assessment History

Table_Apx B-4. Assessment History of DIBP

Authoring Organization	Publication
Other U.S.-based organizations	
U.S. Consumer Product Safety Commission (U.S. CPSC)	<i>Chronic Hazard Panel on Phthalates and Phthalate Alternatives Final Report (With Appendices)</i> (CPSC, 2014) <i>Toxicity Review of Diisobuty Phthalate (DIBP)</i> (CPSC, 2011)
International	
European Union, European Chemicals Agency (ECHA)	<i>Annex to the Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP)</i> (ECHA, 2017a) <i>Opinion on an Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP)</i> (ECHA, 2017b) <i>Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates</i> (ECHA, 2012a) <i>Committee for Risk Assessment (RAC) Opinion on an Annex XV dossier proposing restrictions on four phthalates</i> (ECHA, 2012b)
Government of Canada, Environment Canada, Health Canada	<i>Screening Assessment: Phthalate Substance Grouping</i> (Health Canada, 2020) <i>State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8; 16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6</i> (EC/HC, 2015)

Authoring Organization	Publication
National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Australian Government	<i>C4-6 side chain transitional phthalates: Human health tier II assessment</i> (NICNAS, 2016) <i>Existing chemical hazard assessment report: Diisobutyl phthalate</i> (NICNAS, 2008a) <i>Phthalates hazard compendium: A summary of physicochemical and human health hazard data for 24 ortho-phthalate chemicals</i> (NICNAS, 2008b)

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Appendix C LIST OF TECHNICAL SUPPORT AND SUPPLEMENTAL DOCUMENTS

This appendix includes a list and citations for all supplemental documents included in the draft risk evaluation for DIBP.

Associated **Systematic Review Protocol and Data Quality Evaluation and Data Extraction Documents** – Provide additional detail and information on systematic review methodologies used as well as the data quality evaluations and extractions criteria and results for DIBP.

Draft Systematic Review Protocol for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025ac) – In lieu of an update to the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances*, also referred to as the “2021 Draft Systematic Review Protocol” (U.S. EPA, 2021b), this systematic review protocol for the draft risk evaluation for DIBP describes some clarifications and different approaches that were implemented than those described in the 2021 Draft Systematic Review Protocol in response to (1) SACC comments, (2) public comments, or (3) to reflect chemical-specific risk evaluation needs. This supplemental file may also be referred to as the “DIBP Systematic Review Protocol.”

Draft Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025l) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of physical and chemical properties. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties.”

Draft Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025j) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation for Environmental Fate and Transport. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport.”

Draft Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025k) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of environmental release and occupational exposure. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure.”

Draft Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025n) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file

may also be referred to as the “DIBP Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure.”

Draft Data Extraction Information for General Population, Consumer, and Environmental Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025i) – Provides a compilation of tables for the data extraction for DIBP. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file may also be referred to as the “DIBP Data Extraction Information for General Population, Consumer, and Environmental Exposure.”

Draft Data Quality Evaluation Information for Human Health Hazard Epidemiology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025p) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of epidemiological information. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation Information for Human Health Hazard Epidemiology.”

Draft Data Quality Evaluation Information for Human Health Hazard Animal Toxicology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025o) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of human health hazard animal toxicity information. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation Information for Human Health Hazard Animal Toxicology.”

Draft Data Quality Evaluation Information for Environmental Hazard for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025m) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of environmental hazard toxicity information. This supplemental file may also be referred to as the “DIBP Data Quality Evaluation Information for Environmental Hazard.”

Draft Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025h) – Provides a compilation of tables for the data extraction for DIBP. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation of environmental hazard and human health hazard animal toxicology and epidemiology information. This supplemental file may also be referred to as the “DIBP Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology.”

Associated **Technical Support Documents (TSDs)** – Provide additional details and information on exposure, hazard, and risk assessments for DIBP.

Draft Physical Chemistry and Fate and Transport Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025z)

Draft Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025t)

Draft Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025d](#))

Draft Environmental Media and General Population and Environmental Exposure Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025s](#))

Draft Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025q](#))

Draft Non-cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025w](#))

Draft Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP) ([U.S. EPA, 2025b](#))

Draft Consumer Risk Calculator for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025g](#))

Draft Consumer Exposure Analysis for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025f](#))

Draft Risk Calculator for Occupational Exposures for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025y](#))

Draft Fish Ingestion Risk Calculator for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025u](#))

Draft Surface Water Human Exposure Risk Calculator for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025ab](#))

Draft Ambient Air Exposure Assessment for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025a](#))

Draft Occupational and Consumer Cumulative Risk Calculator for Diisobutyl Phthalate (DIBP) ([U.S. EPA, 2025x](#))

Draft Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP) ([U.S. EPA, 2024b](#)).

Revised Draft Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA) ([U.S. EPA, 2025ad](#)).

Draft Summary of Facility Release Data for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), and Butyl Benzyl Phthalate (BBP) ([U.S. EPA, 2024g](#)).

Appendix D UPDATES TO THE DIBP COU TABLE

Following the release of the final scope ([U.S. EPA, 2020c](#)), EPA received submissions under the 2020 CDR reported data ([U.S. EPA, 2020a](#)). In addition, the reporting name codes changed for the 2020 CDR reporting cycle. The Agency amended the description of certain DIBP COUs and removing COUs that are no longer ongoing based on those new submissions and new reporting name codes as well as based on information EPA received from stakeholders about uses of DIBP. Table_Apx D-1 summarizes the changes to the COUs based on the new reporting codes in the 2020 CDR and any other new information since the publication of the final scope document ([U.S. EPA, 2020c](#)).

Table_Apx D-1. Additions and Name Changes to Categories and Subcategories of COUs Based on CDR Reporting and Stakeholder Engagement

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2024 Draft Risk Evaluation
Processing, Incorporation into articles	Plasticizers; construction	Although this was reported in the 2016 CDR cycle, it was not reported in the 2020 CDR cycle and there are no downstream uses of DIBP in construction to suggest this processing use is occurring (U.S. EPA, 2020a, 2019a).	N/A
Processing, Incorporation into formulation, mixture, or reaction product	Fuels and related products (e.g., fuel additives)	Removed because DIBP is not used as a fuel stabilizer. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, Incorporation into formulation, mixture, or reaction product	Inks, toner, and colorant products (e.g., toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, Incorporation into formulation, mixture, or reaction product	Repackaging (e.g., laboratory chemicals)	Consolidating this category and subcategory under “Processing – repackaging.”	Processing – repackaging (e.g., laboratory chemicals)
Processing, Incorporation into formulation, mixture, or reaction product	Fabric, textile, and leather products not covered elsewhere	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, Incorporation into formulation, mixture, or reaction product	N/A	Added category and subcategory in response to information provided by the company (W.R. Grace & Co., 2024, 2022).	Processing – processing, incorporation into formulation, mixture, or reaction product – pre-catalyst

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			manufacturing (<i>e.g.</i> , catalyst component for polyolefins production)
Processing, As a reactant	N/A	Added category and subcategory in response to information provided by the company as it relates to their customers (W.R. Grace & Co., 2024).	Processing – processing as a reactant – intermediate (plastic manufacturing)
Industrial Use	N/A	Added category and subcategory in response to information provided by manufacturer of DIBP. (LANXESS, 2021a)	Foam in pipeline pigs
Industrial Use	Fuels and related products	Removed because DIBP is not used as a fuel stabilizer. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
Industrial Use	Fabric, textile, and leather products not covered elsewhere (<i>e.g.</i> , textile [fabric] dyes)	Removed because this is not a use of DIBP.	N/A
Industrial Use	Inks, toner, and colorant products (<i>e.g.</i> , toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Building/construction materials not covered elsewhere	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Floor coverings	Removed because this is not a use of DIBP.	N/A
Commercial Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)

Commercial Use	Inks, toner, and colorant products (e.g., toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Commercial Use	Air care products (e.g., air freshener)	Removed because this is not a use of DIBP.	N/A
Commercial Use	N/A	Added category and subcategory based on information of DIBP in turf and tire crumb installation.	Toys, playground, and sporting equipment
Consumer Use	Inks, toner, and colorant products (e.g., toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Consumer Use	Air care products (e.g., air freshener)	Removed because this is not a use of DIBP.	N/A
Consumer Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
Consumer Use	Consumer articles that contain di-isobutyl phthalate from: – Inks, toner and – Paints and coatings – Adhesives and sealants (e.g., paper products)	This is either not a current use of DIBP or consolidated into another COU to avoid duplication.	Consumer use – paints and coatings And Consumer use – adhesives and sealants

As indicated in Table_Apx D-1, the changes are based on close examination of the CDR reports, including the 2020 CDR reports that were received after the scope was completed, additional research on the COUs, additional comments from stakeholders, and overall systematic review of the use information.

When developing this draft risk evaluation, EPA concluded that there were some instances where subcategory information on the processing and uses of DIBP was misreported by CDR reporters based on outreach with stakeholders and the use was no longer ongoing. Therefore, as described in Table_Apx D-1, EPA has made changes to COUs for the risk evaluation.

In addition, EPA did further analysis of the following COUs, which resulted in the changes already presented in the table that warrant further explanation because these COUs were changed significantly between the final scope and the draft risk evaluation:

- *“Processing, processing as a reactant – plasticizer; plastics product manufacturing”* One company reported this use in the 2020 CDR cycle ([U.S. EPA, 2020a](#)). It is EPA’s understanding that this COU is better captured under “processing, incorporation into articles” and “processing, incorporation into formulation, mixture, or reaction product” as DIBP is not used as a reactant.

The use as a plasticizer is more appropriately captured under other processing COUs ([U.S. EPA, 2020d](#)).

- “*Consumer use and commercial use – toys, playground, and sporting equipment*” This COU was included in the final DIBP scope COU table under the consumer life cycle due to comments received, including one containing a technical report that highlighted DIBP found in toy products in Europe and in toys and exercise equipment in Canada ([U.S. EPA, 2020c](#)). EPA notes in the final scope that the U.S. CPSC has banned the use of DIBP at concentrations of greater than 0.1 percent in children’s toys and childcare articles. EPA expects that the use of DIBP in toys manufactured or processed prior to the ban may still be occurring. The Agency has further included this COU due to use of DIBP in a component of tire crumb at the commercial life-cycle stage. This use category was added to the commercial section to cover installation of artificial turfs including tire crumb.

Appendix E CONDITIONS OF USE DESCRIPTIONS

The following descriptions are intended to include examples of uses, so as not to exclude other activities that may also be included in the COUs of the chemical substance. To better describe the COU, EPA considered CDR submissions from previous CDR cycles for DIBP (CASRN 84-69-5), and the COU descriptions reflect what EPA identified as the best fit for those submissions.

E.1 Manufacturing – Domestic Manufacturing

Domestic manufacturing means to manufacture or produce DIBP within the United States. This includes the extraction of DIBP from a previously existing chemical substance or complex combination of chemical substances and loading and repackaging (but not transport) associated with the manufacturing and production of DIBP.

At a typical manufacturing site, DIBP is formed in a closed system by catalytically esterifying phthalic anhydride with n-butyl alcohols (isobutanol). As with other phthalates, the unreacted alcohols are recovered and reused, and the DIBP mixture is purified by vacuum distillation or activated charcoal. The purity of DIBP can achieve 99 percent or greater using current manufacturing processes. The remaining fraction of DIBP may contain a maximum of 0.1 percent water. DIBP functions primarily as a plasticizer in a variety of industries and products. It is a phthalate ester and diester derived from isobutanol, and is used as a plasticizer, hardening agent, curing agent and crosslinker. It is primarily found in adhesives and sealants ([U.S. EPA, 2017b](#); [Kim et al., 2016](#)). DIBP is used as a plasticizer and in mixture formulations in a variety of industrial settings. Specifically, DIBP is used in adhesive manufacturing, chemical manufacturing, coatings, construction, glue manufacturing, plasticizers, plastics product manufacturing, and transportation equipment manufacturing.

Examples of CDR Submissions

In 2016, one CDR company reported domestic manufacturing of DIBP (CASRN 84-69-5) with the manufacturer producing a liquid ([U.S. EPA, 2019a](#)). In 2020, one CDR company reported domestic manufacturing of DIBP (CASRN 84-69-5), with the manufacturer producing a liquid ([U.S. EPA, 2020a](#)).

E.2 Manufacturing – Importing

Import refers to the import of DIBP into the customs territory of the United States. This COU includes unloading and loading storage tanks or other containers as well as repackaging (but not transport) associated with the import of DIBP. In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments. These shipments take the form of oceangoing chemical tankers, railcars, tank trucks, and intermodal tank containers ([U.S. EPA, 2020c](#)).

Examples of CDR Submissions

In 2016, one CDR company reported importation of DIBP (CASRN 84-69-5) with the company importing DIBP as a solid ([U.S. EPA, 2019a](#)). Although the importer did not report import in the 2020 CDR, importation of DIBP could occur ([U.S. EPA, 2020a](#)).

E.3 Processing – Incorporation into Article – Plasticizers (Plastic Product Manufacturing; Transportation Equipment Manufacturing)

This COU refers to the preparation of an article; that is, the incorporation of DIBP into articles, meaning DIBP becomes a component of the article, after its manufacture, for distribution in commerce. In this case, DIBP is present in a raw material such as plastic and transportation equipment manufacturing that

contains a mixture of plasticizers and other additives, and this COU refers to the manufacturing of plastic articles and transportation equipment using those raw materials.

Earthjustice commented that DIBP is used mainly as a plasticizer (making plastics flexible) and a gelling aid in plastics production ([EPA-HQ-OPPT-2018-0434-0014](#)). The Alliance of Automobile Manufacturers and Motor & Equipment Manufacturers Association (MEMA) commented that DIBP is used in automobile manufacturing ([EPA-HQ-OPPT-2019-0131-0022](#)). In its internal data collection, MEMA identified DIBP in 37 parts. In total, in the International Material Data System (IMDS), DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. The average scope of the relative mass of DIBP in the parts from the Alliance's data collection is 1.62 grams ([EPA-HQ-OPPT-2019-0131-0022](#)).

The Aerospace Industries Association (AIA) also identified DIBP presence in aerospace products. The aerospace industry uses DIBP as a constituent within products or formulations for the manufacture, operation and maintenance of aerospace products. The major use of DIBP is in casting sealant ([EPA-HQ-OPPT-2018-0434-0007](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) for Processing – incorporation into article for plasticizers in: plastic product manufacturing is reported in the 2016 CDR by one company ([U.S. EPA, 2019a](#)). In 2016, one CDR company reported import manufacturing of DIBP (CASRN 84-69-5), with the manufacturer producing a solid for use in the transportation equipment sector.

E.4 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Plasticizers (Adhesive Manufacturing; Plastic Product Manufacturing)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce—in this case as a plasticizer in plastic product manufacturing and adhesive manufacturing. In manufacturing of plastic material and resin through non-PVC and PVC compounding, DIBP is blended into polymers. Compounding involves the mixing of the polymer with the plasticizer and other chemical such as fillers and heat stabilizers. The plasticizer needs to be absorbed into the particle to impart flexibility to the polymer. For PVC compounding, compounding occurs through mixing of ingredients to produce a powder (dry blending) or a liquid (Plastisol blending). The most common process for dry blending involves heating the ingredients in a high-intensity mixer and transfer to a cold mixer. The Plastisol blending is done at ambient temperature using specific mixers that allow for the breakdown of the PVC agglomerates and the absorption of the plasticizer into the resin particle.

DIBP is also used within products or formulations for the manufacture, operation, and maintenance of aerospace products. The major use of DIBP is in casting sealant ([EPA-HQ-OPPT-2018-0434-0007](#)).

There are existing adhesive and sealant products that contain DIBP. Information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products ([Azon, 2017](#)). Another product, known as Chem-Set C-19, is a seaming adhesive ([Chemical Concepts Inc, 2014](#)). A third product is Glue 360, which serves as a two-component solid-surface adhesive ([Glue 360 Inc, 2018](#)). Earthjustice commented that Sika, an importer of DIBP that has ceased use, “stated it had imported the

plasticizer for use in the transportation and equipment manufacturing, construction, and adhesive manufacturing sectors. Sika reported that DIBP was used in consumer products in the adhesive and sealant sector, with a maximum concentration between 30 and 60 percent by weight, but not in products intended for children. A literature search for Sika products containing DIBP, from roofing membranes to sealants and adhesives, did not identify any products in which this ingredient is disclosed” ([EPA-HQ-OPPT-2018-0434-0014](#)).

Examples of CDR Submissions

In 2016, one CDR company reported Processing, incorporation into formulation, mixture, or reaction product for adhesive manufacturing of DIBP (CASRN 84-69-5). Use of DIBP (CASRN 84-69-5) for Processing – incorporation into formulation, mixture, or reaction product – plastic product manufacturing is reported in the 2016 CDR by one company in a liquid physical form ([U.S. EPA, 2019a](#)).

E.5 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Solvents (Which Become Part of Product Formulations or Mixture) (Plastic Material and Resin Manufacturing; Paints and Coatings)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, EPA received information that DIBP is processed, as part of a mixture, into a product in plastic material and resin manufacturing and paints and coatings ([U.S. EPA, 2020c](#)).

The manufacturer of Uniplex-155, a DIBP product, stated DIBP is used as a solvent or plasticizer in the production of plastic and rubber products and that it could be used in production of catalysts for polyolefin production or as plasticizer in paint additives ([LANXESS, 2021a, 2015](#)).

Examples of CDR Submissions

In 2012, one company reported processing, incorporation into formulation, mixture, or reaction product as a solvent (which become part of product formulations or mixture) for plastic material and resin manufacturing ([U.S. EPA, 2019a](#)).

E.6 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Processing Aids Not Otherwise Listed

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, EPA was provided information for a product known as Uniplex-155. The manufacturer detailed that Uniplex-155 is used as an additive as a processing aid in foundry solutions ([LANXESS, 2021a](#)).

E.7 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Plastic and Rubber Products Not Covered Elsewhere

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, DIBP is listed in a product category for plastic and rubber products not covered elsewhere. The product Uniplex 155 lists DIBP as a

solvent or plasticizer in the production of plastic and rubber products ([LANXESS, 2015](#)) and “plastic and rubber products not covered elsewhere” was reported in the commercial use lifecycle in the 2016 CDR cycle ([U.S. EPA, 2019a](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) for the Commercial use category – plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form ([U.S. EPA, 2019a](#)).

E.8 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Pre-Catalyst Manufacturing (e.g., Catalyst Component for Polyolefins Production)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, DIBP is purchased from a U.S. supplier and arrive in drums or totes, then the phthalate is emptied into a storage vessel or feed vessel, under gravity feed. It is sealed to prevent water and air penetration, and samples are pulled in a way that avoids exposure to air or moisture. DIBP is used as an electron donor in pre-catalyst formulations that are ultimately used as a catalyst intermediate in polypropylene (PP) manufacturing ([Company Withheld, XXXX](#); [W.R. Grace & Co., 2022](#)). Phthalates, like DIBP, are included in the solids in the pre-catalyst at about 10 percent. The phthalate itself is not a catalyst but is a solid that is suspended in a solvent or an oil. The solid is 20 to 25 percent weight dry pre-catalyst, resulting in 2 to 2.5 percent of phthalate in the drums. That material is then sold to their customers ([W.R. Grace & Co., 2024](#)). One company stated that DIBP could be used in production of catalysts for polyolefin production ([LANXESS, 2021a](#)).

Examples of CDR Submissions

No manufacturers reported this use for DIBP in the 2012 or 2016 CDR cycles ([U.S. EPA, 2019a](#)). EPA was informed of this COU as a pre-catalyst component for polyolefins production during a meeting with the DIBP Consortium ([W.R. Grace & Co., 2024](#)).

E.9 Processing – Processing as a Reactant – Intermediate (Plastic Manufacturing)

This COU refers to a chemical substance that is used in chemical reactions for the manufacturing of another chemical substance or product. In this case, DIBP is used in a catalyst formulation for processing as a reactant in the generation of polyolefins (i.e., polypropylene and polyethylene). One company stated that DIBP could be used in production of catalysts for polyolefin production ([LANXESS, 2021a](#)). EPA spoke with the company producing and selling the pre-catalyst product and were informed that very small amounts are used for the catalyst (i.e., 1 g used for 40,000 g of polypropylene) and the catalyst is mostly destroyed during the reaction (i.e., 1–3 ppm remain in polyolefin plastic) ([W.R. Grace & Co., 2024](#)). The phthalate then remains in polymer where it is encapsulated.

Examples of CDR Submissions

No manufacturers reported this use for DIBP in the 2012 or 2016 CDR cycles ([U.S. EPA, 2019a](#)). EPA was informed of this use via the DIBP Consortium and the company ([W.R. Grace & Co., 2024](#)); EPA-HQ-OPPT-2018-0434-0049.

E.10 Processing – Repackaging (e.g., Laboratory Chemicals)

Repackaging refers to the preparation of DIBP for distribution in commerce in a different form, state, or quantity than originally received or stored by various industrial sectors—including chemical product and preparation manufacturing, wholesale and retail trade, and laboratory chemicals manufacturing. This COU includes the transferring of DIBP from a bulk container into smaller containers but would not apply to the relabeling or redistribution of a chemical substance without removing the chemical substance from the original shipping container.

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)); however, one company provided an SDS that was updated in August 2024 for DIBP as a laboratory use and shared information about the repackaging process that takes place for phthalate chemicals ([U.S. EPA, 2020a, 2019a](#); [UCSF, 2019](#)).

E.11 Processing – Recycling

This COU refers to the process of treating generated waste streams (*i.e.*, which would otherwise be disposed of as waste), containing DIBP, that are collected, either on-site or at a third-party site, for commercial purposes. DIBP is primarily recycled industrially in the form of DIBP-containing PVC waste streams. New PVC can be manufactured from recycled and virgin materials at the same facility. EPA notes that although DIBP was not reported for recycling in the 2016 or 2020 CDR reporting periods, recycling waste streams could contain DIBP ([U.S. EPA, 2020a, 2019a](#)).

DIBP is also reported to be in a component of tire crumb rubber, which is used in playgrounds and playing fields. DIBP may also be a part of other components in playing field based on results of federal research on exposure to chemicals in outdoor and indoor playing fields ([U.S. EPA, 2019e](#)).

E.12 Distribution in Commerce

For purposes of assessment in this draft risk evaluation, distribution in commerce consists of the transportation associated with the moving of DIBP or DIBP-containing products between sites, manufacturing, processing, or recycling DIBP or DIBP-containing products, to final use sites or for final disposal of DIBP or DIBP-containing products. More broadly under TSCA, “distribution in commerce” and “distribute in commerce” are described under TSCA section 3(5).

E.13 Industrial Use – Foam for Pipeline Pigs

This COU refers to DIBP as it is used in various industrial sectors as a component for foam used as a cleaning component on pipeline pigs. DIBP has been found in formulations for this use at approximately 1 to 5 percent ([LANXESS, 2021a](#)).

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.14 Industrial Use – Paints and Coatings

This COU refers to DIBP as it is used in various industrial sectors as a component of paints and coating mixtures, meaning the use of DIBP after it has already been incorporated into a paint or coating product or mixture, as opposed to when it is used upstream, (*e.g.*, when DIBP is processed into a coating formulation). DIBP products list coatings as a recommended use as a plasticizer in paint additives ([Aceto US LLC, 2022](#); [LANXESS, 2021a](#)).

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.15 Industrial Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU refers to DIBP as it is used in various industrial sectors as a component of plastic and rubber products not covered elsewhere, meaning the use of DIBP after it has already been incorporated into a plastic or rubber product or mixture, as opposed to when it is used upstream, (*e.g.*, when DIBP is processed into a coating formulation). In the 2016 CDR cycle DIBP is reported under the Commercial use category for plastic and rubber products not covered elsewhere ([U.S. EPA, 2019a](#)).

The Center for Environmental Health (CEH) commented that DIBP is often a byproduct or intermediate in the production of phthalate containing plastics ([EPA-HQ-OPPT-2018-0434-0005](#)). Given the use of DIBP as a general-purpose plasticizer for PVC and non-PVC applications, DIBP has been noted to be in a variety of articles such as food conveyor belts, tarps, weather stripping and traffic cones ([U.S. EPA, 2020e](#)).

The type of products being reported under this code are likely to be industrial, commercial, and consumer in nature. The expected users of products under this category would be anticipated to use liquid or solid mixtures containing DIBP and mold or otherwise form the various products for industrial, commercial, and consumer applications.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts ([EPA-HQ-OPPT-2019-0131-0022](#)). In total, in IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle and include door, hood, and convertible top assemblies ([EPA-HQ-OPPT-2019-0131-0022](#)). DIBP has also been found in tire crumb ([U.S. EPA, 2019e, 2016a](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) for the Commercial use product category: plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form ([U.S. EPA, 2019a](#)).

E.16 Industrial Use – Adhesives and Sealants (Two-Component Glues and Adhesives; Transportation Equipment Manufacturing)

This COU refers to DIBP as it is used in various industrial sectors as a component of adhesive or sealant mixtures—meaning the use of DIBP after it has already been incorporated into an adhesive and/or sealant for transportation equipment manufacturing product or mixture, as opposed to when it is used upstream. For example, when DIBP is processed into the adhesive and sealant formulation.

DIBP has been listed as a constituent within products or formulations for the manufacture, operation, and maintenance of aerospace products. DIBP is used in casting sealant ([EPA-HQ-OPPT-2018-0434-0007](#)). In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts ([EPA-HQ-OPPT-2019-0131-0022](#)). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. MEMA members reported using DIBP in non-dimensional uses such as adhesives and sealants as well ([EPA-HQ-OPPT-2019-0131-0022](#)).

There are existing adhesive products that contain DIBP. According to information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified DIBP as a component of a

catalyst mixture for accelerating the reaction time for waterstop products ([Azon, 2017](#)). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and may still be manufactured using DIBP ([Chemical Concepts Inc, 2014](#)). A third product called Glue 360, which is manufactured with DIBP, serves as a two-component solid surface adhesive ([Glue 360 Inc, 2018](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) for the industrial sector as a plasticizer for adhesive and sealant manufacturing was reported by one manufacturer in the 2016 CDR ([U.S. EPA, 2019a](#)).

E.17 Commercial Use – Adhesives and Sealants (Two-Component Glues and Adhesives)

This COU is referring to the commercial use of DIBP in adhesives and sealants. This means the use of DIBP-containing adhesives and sealants in a commercial setting, such as a business or at a job site, as opposed to upstream use of DIBP (*e.g.*, when DIBP containing products are used in the manufacturing of transportation equipment) or use in an industrial setting.

Workers in a commercial setting generally apply adhesives and sealants that already have DIBP incorporated as a plasticizer. Adhesives and sealants (which could also be fillers and putties) are highly malleable materials used to repair, smooth over, or fill minor cracks in holes and buildings.

DIBP use is covered under industrial and processing COUs and use could occur in the commercial sector use as well (during *e.g.*, repair of transportation equipment). DIBP has been listed as a constituent within products or formulations for the manufacture, operation, and maintenance of aerospace products. The major use of DIBP is in casting sealant ([EPA-HQ-OPPT-2018-0434-0007](#)).

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts ([EPA-HQ-OPPT-2019-0131-0022](#)). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. Alliance members reported using DIBP in non-dimensional uses such as adhesives and sealants as well ([EPA-HQ-OPPT-2019-0131-0022](#)).

There are existing adhesive products that contain DIBP. According to information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified the use DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products ([Azon, 2017](#)). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and could still be manufactured using DIBP ([Chemical Concepts Inc, 2014](#)). A third product called Glue 360 that is manufactured with DIBP serves as a two-component solid surface adhesive ([Glue 360 Inc, 2018](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) in the commercial sector as a plasticizer for adhesive and sealant products was reported by one manufacturer in the 2016 CDR ([U.S. EPA, 2019a](#)).

E.18 Commercial Use – Paints and Coatings

This COU is referring to the commercial use of DIBP already incorporated as a plasticizer in paint and coating products. EPA found coating use in a product known as ACETO, so use could occur in a

commercial setting ([Aceto US LLC, 2022](#)). DIBP products list coatings as a recommended use and one company stated that DIBP could be used in production of catalysts for polyolefin production or as a plasticizer in paint additives ([LANXESS, 2021a](#)).

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.19 Commercial Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU is referring to the commercial use of DIBP as a plasticizer in various articles with routine direct contact during normal use including rubber and plastic articles. In the 2016 CDR cycle DIBP is reported under the commercial use category for plastic and rubber products not covered elsewhere ([U.S. EPA, 2019a](#)).

CEH commented that DIBP is often a byproduct or intermediate in the production of phthalate containing plastics ([EPA-HQ-OPPT-2018-0434-0005](#)). Given the use of DIBP as a general-purpose plasticizer for PVC and non-PVC applications, DIBP has been noted to be in a variety of articles such as food conveyor belts, tarps, weather stripping, and traffic cones ([U.S. EPA, 2020e](#)).

The type of products being reported under this code are likely to be industrial, commercial, and consumer in nature. The expected users of products under this category would be anticipated to use liquid or solid mixtures containing DIBP and mold or otherwise form the various products for industrial, commercial, and consumer applications.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts ([EPA-HQ-OPPT-2019-0131-0022](#)). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies ([EPA-HQ-OPPT-2019-0131-0022](#)). DIBP has also been found in tire crumb ([U.S. EPA, 2019e, 2016a](#)). Given commercial use of tire auto parts may include direct contact with DIBP articles in rubber, EPA is currently assessing tire replacement scenarios.

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) in the commercial sector as a plasticizer for other articles with routine direct contact during normal use including rubber articles; plastic articles (hard), was reported by one manufacturer in the 2020 CDR ([U.S. EPA, 2020a](#)).

E.20 Commercial Use – Laboratory Chemicals

This COU is referring to the commercial use of DIBP in laboratory chemicals.

DIBP can be used as a laboratory chemical, such as a chemical standard or reference material during analyses. Some laboratory chemical manufacturers identify use of DIBP as a certified reference material and research chemical ([U.S. EPA, 2020c](#)). The users of products under this category would be expected to apply these products through general laboratory use applications. Commercial use of laboratory chemicals may involve handling DIBP by hand-pouring and either adding to the appropriate labware in its pure form to be diluted later or added to dilute other chemicals already in the labware.

This use was not reported to EPA in the 2016 or 2020 CDR reporting cycles; however, EPA has reviewed SDSs for a DIBP product that is used to synthesize substances for laboratory chemicals ([Sigma-Aldrich, 2024](#); [U.S. EPA, 2020a, 2019a](#)).

E.21 Commercial Use – Toys, Playground, and Sporting Equipment

This COU is referring to the commercial use of DIBP in subcategory of toys, playground, and sporting equipment. DIBP is reported to be a component of tire crumb rubber, which is used in playgrounds and playing fields ([U.S. EPA, 2019e, 2016a](#)). DIBP may also be a part of other components in playing field based on results of federal research on exposure to chemicals in outdoor and indoor playing fields ([U.S. EPA, 2016a](#)).

DIBP was detected in synthetic turf during a study that included 546 recycled tire crumb samples from 91 fields ([U.S. EPA, 2019e](#)). DIBP was found in both indoor and outdoor playing fields.

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.22 Consumer Use – Floor Coverings

This COU is referring to the consumer use of DIBP in floor coverings.

DIBP was reported in two carpet tile samples obtained from a U.S. retailer ([EPA-HQ-OPPT-2018-0434-0014](#)). One carpet contained DIBP concentrations of 230 ppm in the backing of a tile carpet product, Super Flor 41Z. Super Flor is a tile carpet with face fiber composed of 82.5 percent nylon and 17.5 percent polyester. It has a Graphlar backing made from bitumen. It contains 42 percent post-industrial/pre-consumer recycled content (limestone and polyester). The second carpet contained DIBP concentrations of 210 ppm in the backing of a tile carpet product, On Line Marigold. On Line is a commercial carpet tile with face fiber made from 100 percent recycled Nylon 6 and a Glas-Bac backing made from PVC, including recycled content. Overall, it is made from 72 percent recycled content.

DIBP was identified in vinyl floor coverings during a Danish Ministry of the Environment study, *Phthalates in Products with Large Surfaces* ([Danish EPA, 2010](#)). DIBP is also proposed for restriction in a subsequent Danish EPA Annex Report ([Danish EPA, 2011](#)). Given the date of these reports, DIBP identified in vinyl floor coverings could be a legacy use in consumer's homes—even if floor coverings containing DIBP are no longer imported.

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.23 Consumer Use – Toys, Playground, and Sporting Equipment

This COU is referring to the consumer use of DIBP in toys, playground, and sporting equipment that contain DIBP in an indoor environment. The use also refers to the DIY building of home sporting equipment. DIBP can be used as a plasticizer to provide flexibility to toys. The Consumer Product Safety Improvement Act (CPSIA) of 2008 limited manufacturers' use of DIBP in children's toys to 0.1 percent (16 CFR part 1307). Toys containing higher concentrations of DIBP that were manufactured and/or processed prior to the CPSIA restriction in 2008 may still be in use. EPA expects that the use of DIBP in toys manufactured or processed prior to the ban may still be occurring ([U.S. EPA, 2020b](#)).

DIBP is also reported to be in a component of tire crumb, which is used in playgrounds and playing fields ([U.S. EPA, 2019e, 2016a](#)). DIBP may also be a part of other components in playing field based on

results of federal research on exposure to chemicals in outdoor and indoor playing fields ([U.S. EPA, 2019e](#)). Exposure could occur during the use of the fields.

DIBP was detected in synthetic turf during a study that included 546 recycled tire crumb samples from 91 fields ([U.S. EPA, 2019e](#)). DIBP was found in both indoor and outdoor playing fields.

In the *Technical Report on the Conditions of Use* provided by Earthjustice, the commenter highlights the use of DIBP in toys in Europe from a survey of toys sold in Europe published in 2010 that found DIBP was in 2 percent of products obtained in Austria, Germany, the Netherlands, and Switzerland retailers ([EPA-HQ-OPPT-2018-0434-0014](#)). The commenter added that Canadian use of DIBP was identified in toys and exercise equipment (*e.g.*, yoga mats, balance balls), according to a 2014 report by Environment Canada.

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.24 Consumer Use – Paints and Coatings

This COU is referring to the consumer use of DIBP already incorporated as a plasticizer in paint and coating products. DIBP products list coatings as a recommended use and one company stated that DIBP could be used in production of catalysts for polyolefin production or as a plasticizer in paint additives ([Aceto US LLC, 2022](#); [LANXESS, 2021a](#)).

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.25 Consumer Use – Fabric, Textile, and Leather Products Not Covered Elsewhere (*e.g.*, Textile [Fabric] Dyes)

This COU is referring to the consumer use of DIBP in fabrics, textiles, and leather products not covered elsewhere.

In 2013, EPA received information regarding a product, ICOPOR pigment paste, which is used to color high-solids or solvent-free polyurethane resins and PVC plastisols used to manufacture artificial leathers and textile products ([Dow Chemical, 2013](#)). In the DIBP final scope document, the SDS was the basis for the COU of Industrial use related to fabric, textile and leather products ([U.S. EPA, 2020c](#)).

According to that document, there appear to be two life cycle stages for which DIBP is used in the product—once when it is formulated to produce a paste and then when it is used as a colorant for artificial leather. Although there was an existing industrial COU, and an additional processing COU, the product is outdated and not believed to be in use anymore. With that stated, the legacy products containing DIBP may still exist for consumers and is why EPA will include consumer use of fabric, textile, and leather products not covered elsewhere in the draft risk evaluation.

This COU was not reported in the 2016 or 2020 CDR cycles ([U.S. EPA, 2020a, 2019a](#)).

E.26 Consumer Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU is referring to the consumer use of DIBP in plastics and rubber productions not covered elsewhere.

DIBP is used in various industrial sectors as a component of plastic and rubber products not covered elsewhere (*e.g.*, phone chargers, shower curtains, garden hoses, tape), meaning the use of DIBP after it

has already been incorporated into a plastic or rubber product or mixture. DIBP is listed in a product category for Plastic and rubber products not covered elsewhere for commercial use during the 2016 CDR reporting period ([U.S. EPA, 2019a](#)).

In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies ([EPA-HQ-OPPT-2019-0131-0022](#)). DIBP has also been found in tire crumb ([U.S. EPA, 2019e, 2016a](#)). Given DIY replacement of tires and tire parts may include direct contact with DIBP articles in rubber, EPA is currently assessing tire replacement scenarios.

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) for the Commercial Use Product Category: Plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form ([U.S. EPA, 2019a](#)).

E.27 Consumer Use – Adhesives and Sealants

This COU refers to the consumer use of DIBP in adhesives and sealants.

EPA expects that the use of these types of products would occur in commercial applications; however, the Agency notes that these products are likely to be sourced by DIY consumers through various online vendors.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts ([EPA-HQ-OPPT-2019-0131-0022](#)). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies ([EPA-HQ-OPPT-2019-0131-0022](#)). Alliance members reported using DIBP in non-dimensional uses, where the presence of the chemicals does not have a firm physical dimension (such as hard parts do), such as adhesives and sealants as well ([EPA-HQ-OPPT-2019-0131-0022](#)). It is likely that consumers repairing their own vehicles (e.g., radio replacement) could be exposed to DIBP in parts.

There are existing adhesive products that contain DIBP. According to information provided to EPA, such as the SDS from 2017 for a product called Azo-Cat 25 that identified the use of DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products ([Azon, 2017](#)). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and is reasonably foreseen as an adhesive that is still manufactured using DIBP ([Chemical Concepts Inc, 2014](#)). A third product called Glue 360 that is manufactured with DIBP serves as a two-component solid surface adhesive ([Glue 360 Inc, 2018](#)).

Examples of CDR Submissions

Use of DIBP (CASRN 84-69-5) in adhesives and sealant products in the consumer sector was reported by one manufacturer in the 2016 CDR ([U.S. EPA, 2019a](#)).

E.28 Disposal

Each of the COUs of DIBP may generate waste streams of the chemical. For purposes of the draft DIBP risk evaluation, this COU refers to the DIBP in a waste stream that is collected from facilities and households and are unloaded at a treatment or disposed at third-party sites. This COU also encompasses DIBP contained in wastewater discharged to publicly owned treatment works (POTW) or other, non-POTWs for treatment, and other wastes. DIBP is expected to be released to other environmental media,

6404 such as introductions of biosolids to soil or migration to water sources, through waste disposal (*e.g.*,
6405 disposal of formulations containing DIBP, plastic and rubber products, fabrics, and transportation
6406 equipment) ([U.S. EPA, 2020c](#)). Disposal may also include destruction and removal by incineration ([U.S.](#)
6407 [EPA, 2021c](#)). Recycling of DIBP and DIBP-containing products is considered a separate COU.
6408 Environmental releases from industrial sites are assessed in each COU.

Appendix F DRAFT OCCUPATIONAL EXPOSURE VALUE DERIVATION

EPA has calculated a draft 8-hour existing chemical occupational exposure value to summarize the OES and sensitive health endpoints into a single value. This calculated draft value may be used to support risk management efforts for DIBP under TSCA section 6(a), 15 U.S.C. § 2605. EPA calculated the draft value rounded to 1.5 mg/m³ for inhalation exposures to DIBP as an 8-hour time-weighted average (TWA) and for consideration in workplace settings (see Appendix F.1) based on the acute, non-cancer human equivalent concentration (HEC) for developmental toxicity (*i.e.*, decreased fetal testicular testosterone).

Because TSCA requires risk evaluations to be conducted without consideration of costs and other non-risk factors, this draft occupational exposure value represents a risk-only number. If risk management for DIBP follows the finalized risk evaluation, EPA may consider costs and other non-risk factors, such as technological feasibility, the availability of alternatives, and the potential for critical or essential uses. Any existing chemical exposure limit used for occupational safety risk management purposes could differ from the draft occupational exposure value presented in this appendix based on additional consideration of exposures and non-risk factors consistent with TSCA section 6(c).

This calculated draft value for DIBP represents the exposure concentration below which exposed workers and ONUs are not expected to exhibit any appreciable risk of adverse toxicological outcomes, accounting for PESS. It is derived based on the most sensitive human health effect (*i.e.*, decreased fetal testicular testosterone) and exposure duration (*i.e.*, acute) relative to benchmarks and a standard occupational scenario assumption of an 8-hour workday.

EPA expects that at the draft occupational exposure value of 0.13 ppm (1.5 mg/m³), a worker or ONU also would be protected against developmental toxicity from intermediate and chronic duration occupational exposures if ambient exposures are kept below this draft occupational exposure value. The Agency has not separately calculated a draft short-term (*i.e.*, 15-minute) occupational exposure value because EPA did not identify hazards for DIBP associated with this very short duration.

The Occupational Safety and Health Administration (OSHA) has not set a permissible exposure limit (PEL) as an [8-hour TWA for DIBP](#). EPA located several occupational exposure limits for DIBP (CASRN 84-69-5) in other countries (<https://ilv.ifa.dguv.de/limitvalues/21276>). Identified 8-hour TWA values range from 1 mg/m³ in Latvia to 5 mg/m³ in Ireland, New Zealand, South Africa, and the United Kingdom. Additionally, EPA found that [New Zealand](#) and the [United Kingdom](#) have both established an occupational exposure limit of 5 mg/m³ (8-hour TWA) in each country's code of regulation that is enforced by each country's worker safety and health agency.

F.1 Draft Occupational Exposure Value Calculations

This appendix presents the calculations used to estimate draft occupational exposure values using inputs derived in this draft risk evaluation. Multiple values are presented below for hazard endpoints based on different exposure durations. For DIBP, the most sensitive occupational exposure value is based on non-cancer developmental effects and the resulting 8-hour TWA is rounded to 1.5 mg/m³.

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Draft Acute Non-Cancer Occupational Exposure Value

The draft acute occupational exposure value (EV_{acute}) was calculated as the concentration at which the acute MOE would equal the benchmark MOE for acute occupational exposures using Equation_Apx F-1:

Equation_Apx F-1.

$$EV_{acute} = \frac{HEC_{acute}}{Benchmark\ MOE_{acute}} * \frac{AT_{HEC_{acute}}}{ED} * \frac{IR_{resting}}{IR_{workers}} =$$

$$\frac{2.7\ ppm}{30} * \frac{\frac{24h}{d}}{\frac{8h}{d}} * \frac{0.6125\ \frac{m^3}{hr}}{1.25\ \frac{m^3}{hr}} = 0.13\ ppm$$

$$EV_{acute}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm * MW}{Molar\ Volume} = \frac{0.13\ ppm * 278.35\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = 1.5\ \frac{mg}{m^3}$$

Draft Intermediate Non-Cancer Occupational Exposure Value

The draft intermediate occupational exposure value ($EV_{intermediate}$) was calculated as the concentration at which the intermediate MOE would equal the benchmark MOE for intermediate occupational exposures using Equation_Apx F-2:

Equation_Apx F-2.

$$EV_{intermediate} = \frac{HEC_{intermediate}}{Benchmark\ MOE_{intermediate}} * \frac{AT_{HEC\ intermediate}}{ED * EF} * \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{2.7\ ppm}{30} * \frac{\frac{24h}{d} * 30d}{\frac{8h}{d} * 22d} * \frac{0.6125\ \frac{m^3}{hr}}{1.25\ \frac{m^3}{hr}} = 0.18\ ppm = 2.1\ \frac{mg}{m^3}$$

Draft Chronic Non-Cancer Exposure Value

The draft chronic occupational exposure value ($EV_{chronic}$) was calculated as the concentration at which the chronic MOE would equal the benchmark MOE for chronic occupational exposures using Equation_Apx F-3:

Equation_Apx F-3.

$$EV_{chronic} = \frac{HEC_{chronic}}{Benchmark\ MOE_{chronic}} * \frac{AT_{HEC\ chronic}}{ED * EF * WY} * \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{2.7\ ppm}{30} * \frac{\frac{24h}{d} * \frac{365d}{y} * 40\ y}{\frac{8h}{d} * \frac{250d}{y} * 40\ y} * \frac{0.6125\ \frac{m^3}{hr}}{1.25\ \frac{m^3}{hr}} = 0.19\ ppm = 2.2\ \frac{mg}{m^3}$$

Where:

$AT_{HEC_{acute}}$ = Averaging time for the POD/HEC used for evaluating non-cancer acute occupational risk based on study conditions and HEC

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6489		adjustments (24 h/day).
6490	$AT_{HEC_{intermediate}}$	= Averaging time for the POD/HEC used for evaluating non-cancer
6491		intermediate occupational risk based on study conditions and/or
6492		any HEC adjustments (24 h/day for 30 days).
6493	$AT_{HEC_{chronic}}$	= Averaging time for the POD/HEC used for evaluating non-cancer
6494		chronic occupational risk based on study conditions and/or HEC
6495		adjustments (24 h/day for 365 days/year) and assuming the
6496		same number of years as the high-end working years (WY, 40
6497		years) for a worker.
6498	$Benchmark\ MOE_{acute}$	= Acute non-cancer benchmark margin of exposure, based on the
6499		total uncertainty factor of 30
6500	$Benchmark\ MOE_{intermediate}$	= Intermediate non-cancer benchmark margin of exposure, based on
6501		the total uncertainty factor of 30
6502	$Benchmark\ MOE_{chronic}$	= Chronic non-cancer benchmark margin of exposure, based on the
6503		total uncertainty factor of 30
6504	EV_{acute}	= Acute occupational exposure value
6505	$EV_{intermediate}$	= Intermediate occupational exposure value
6506	$EV_{chronic}$	= Chronic occupational exposure value
6507	ED	= Exposure duration (8 h/day)
6508	EF	= Exposure frequency (1 day for acute, 22 days for intermediate, and
6509		250 days/year for chronic and lifetime)
6510	HEC	= Human equivalent concentration for acute, intermediate, or chronic
6511		non-cancer OES
6512	IR	= Inhalation rate (default is 1.25 m ³ /h for workers and 0.6125 m ³ /h
6513		assumed from “resting” animals from toxicity studies)
6514	$Molar\ Volume$	= 24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
6515	MW	= Molecular weight of DIBP (278.35 g/mole)
6516	WY	= Working years per lifetime at the 95th percentile (40 years).

6517
6518 Unit conversion:6519 1 ppm = 11.38 mg/m³ (see equation associated with the EV_{acute} calculation)