



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

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MEMORANDUM

SUBJECT: 1-Bromopropane: Fenceline Technical Support – Ambient Air Pathway

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This memorandum summarizes examination of reasonably available data for the fenceline analysis for the ambient air pathway to support the risk management of 1-bromopropane (1-BP) under TSCA. The ambient air pathway was not previously evaluated in the published risk evaluation for 1-BP for exposures to the general population.¹ However, the draft report for the March 15–17, 2022, Science Advisory Committee on Chemicals (SACC) meeting held on the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities Version 1.0* (2022 Fenceline Report) included preliminary results for 1-BP as a case study to demonstrate the application and efficacy of the proposed methodology for evaluating the ambient air pathway. Further, recent work presented in

¹ <https://www.regulations.gov/document/EPA-HQ-OPPT-2016-0741-0103>

this memorandum considers feedback from the 2022 Fenceline SACC meeting. Specifically, one of the SACC’s recommendations was that EPA should evaluate multiple years of chemical release data to estimate exposures and associated risks to fenceline communities.

The methods and results sections included in this memorandum highlight two approaches for evaluating exposures via inhalation and estimating associated risk to fenceline communities from 1-BP via the ambient air pathway. The first approach uses the methods presented during the 2022 Fenceline SACC meeting and is referred to as the “2022 fenceline analysis.” It includes both a “pre-screening” and “full-screening” analyses and uses a single year of release data (2019) from the Toxics Release Inventory (TRI). The second approach expands upon the 2022 fenceline analysis using a modified pre-screening methodology and considers multiple years (2016 through 2020) of TRI release data. The latter approach as described herein is referred to as the “multi-year analysis.”

In summary, the overall 1-BP risk profile² from the multi-year analysis for both non-cancer and cancer effects is no different than the 2022 fenceline analysis—even though the multi-year analysis identified additional facilities with risk estimates above the benchmark for cancer³ that were not captured by the original data set for the 2022 fenceline analysis.⁴

1 METHODS

1.1 2022 Fenceline Analysis

The 2022 fenceline analysis for the ambient air pathway used reasonably available data and models to quantify environmental releases, evaluate exposures via inhalation, and characterize risks associated with such releases and exposures via the ambient air pathways previously not evaluated in the published risk evaluation for 1-BP. The 2022 fenceline analysis for 1-BP applied the methodology presented to SACC in the draft report for the 2022 fenceline analysis⁵ to evaluate exposures and associated risks to a subset of the general population defined as “fenceline communities” via the ambient air pathway. This methodology consisted of a facility-by-facility evaluation of all 1-BP releases reported to TRI over a single reporting year (2019). Data for this reporting year were obtained from the TRI database (TRI basic plus files downloaded circa May of 2021). Annual release data for 1-BP were extracted from the entire TRI data set for all facilities reporting air releases of 1-BP for the 2019 TRI reporting year. The 2022 fenceline report includes a detailed description of the fenceline methodology; however, a summary of this methodology, as applied for 1-BP, is provided below.

1.1.1 Mapping Facility Releases to Occupational Exposure Scenarios and Conditions of Use

The mapping of facility release information to occupational exposure scenarios (OES) and conditions of use (COUs) is presented in the 2022 Fenceline Report. An expanded discussion on these methodologies

² Occupational exposure scenarios (OES) or conditions of use (COU) with risk estimates above the benchmark for cancer at the distances evaluated.

³ Although risk estimates above the benchmark for cancer are summarized in this memorandum, 1-BP also has acute and chronic risk estimates below the benchmarks for non-cancer endpoints (developmental post-implantation loss).

⁴ The 2022 fenceline analysis used 2019 TRI release data extracted for use in the analysis circa May of 2021. As discussed in the assumptions and uncertainties section of this memorandum, TRI is constantly updated and there may be facilities that did not have reported releases in the 2019 TRI dataset at the time of extraction for the 2022 fenceline analysis but have since updated releases in TRI with newly reported or revised release values that would have been captured by the latest multi-year TRI release data extracted on August 5, 2022, for use in the multi-year analysis.

⁵ <https://www.regulations.gov/docket/EPA-HQ-OPPT-2021-0415/document>

as well as the key assumptions and limitations are presented in Sections 2.1, 2.2, and 2.4 of the 2022 Fenceline Report, respectively. Relevant limitations of the facility mapping approach are provided in the limitations and uncertainties section of this memorandum to highlight the dependence of facility mapping on the information collected in primary sources of release information such as TRI.

The fenceline analysis for the ambient air pathway organizes facilities by OES and attempts to map each facility with the associated COU included in the published risk evaluation for 1-BP in this memorandum. An initial step in mapping facility releases to a condition of use involves linking reported TRI facility use information with Chemical Data Reporting (TRI-CDR crosswalk) codes and to an OES. An OES can be defined as a specific set of facts, assumptions, and inferences that can be used to describe how and when exposure and releases occurs. An OES may be associated with a single COU or multiple COU as shown in the published risk evaluation for 1-BP and the 2022 Fenceline Report.

1.1.2 Ambient Air Pre-screening Methodology

The pre-screening methodology utilized EPA's Integrated Indoor/Outdoor Air Calculator (IIOAC) model⁶ to estimate high-end and central tendency (mean) 1-BP concentrations in ambient air at three distances from an emitting facility (100, 100 to 1,000, and 1,000 m). EPA developed and evaluated 16 different exposure scenarios for each of two categorical release values⁷ designed to capture a variety of release types, topography, meteorological conditions, and release scenarios. A diagram of these exposure scenarios is provided in Appendix A, Figure A-1. Findings from the pre-screening analysis informed the need for a full-screening analysis as well as provided insight into whether risk estimates above the benchmarks are or are not expected for 1-BP.

1.1.3 Ambient Air Full-Screening Methodology

The full-screening methodology utilized the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD)⁸ to estimate 1-BP concentrations in ambient air at eight finite distances (5, 10, 30, 60, 100, 2,500, 5,000, and 10,000 m) and one area distance (100 to 1,000 m) from an emitting facility. EPA modeled two different types of release estimates, as applicable, for 1-BP: (1) facility-specific chemical releases with source attribution when 2019 TRI data was available, and (2) alternative release estimates representing a generic facility when 2019 TRI data was not available for an OES. Daily and period average outputs were obtained via modeling and post-processing scripts were used to extract a variety of statistics from the modeled concentration distribution, including the 95th (high-end), 50th (central tendency), and 10th (low-end) percentile 1-BP concentrations at each distance modeled. Modeled air concentrations were then used to derive acute concentrations, average daily concentrations, and lifetime average daily concentrations (based on 33 years of continuous exposure over a 78-year lifetime).

Estimates of risk to fenceline communities were calculated based on the modeled exposure concentrations from the 2022 fenceline analysis and the acute and chronic hazard values for continuous inhalation exposure presented in the published risk evaluation for 1-BP and in Table 1-1. Risk estimates are interpreted in relation to the benchmark values corresponding to each hazard value.⁹ For example, cancer risk estimates represent the incremental increase in probability of an individual in an exposed

⁶ <https://www.epa.gov/tsca-screening-tools/iioac-integrated-indoor-outdoor-air-calculator>

⁷ The "pre-screening" methodology from the 2022 fenceline analysis evaluated two categorical release values across all facilities reporting releases to the 2019 TRI. The first value is the maximum single facility release reported across all facilities reporting. The second value is the mean (arithmetic average) of all releases reported across all facilities reporting.

⁸ <https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod>

⁹ When considering acute and chronic non-cancer effects, risk estimates less than the associated benchmarks are flagged. When considering excess lifetime cancer risk, risk estimates greater than the associated benchmark are flagged.

population developing cancer over a lifetime (excess lifetime cancer risk) following exposure to the chemical. Cancer risk estimates greater than the benchmark values are flagged. Standard cancer benchmarks used by EPA and other regulatory agencies are an increased cancer risk above benchmarks ranging from 1 in 1,000,000 to 1 in 10,000 (*i.e.*, 1×10^{-6} to 1×10^{-4}), depending on the subpopulation exposed. In the 2022 fenceline analysis and this multi-year analysis, EPA uses 1×10^{-6} as the benchmark for the cancer risk to individuals in the general population (*e.g.*, fenceline communities).¹⁰ The 1×10^{-6} value is not a bright line and EPA has discretion to make risk determinations for the chemical substance based on other benchmarks and information as appropriate.

Table 1-1. Inhalation Hazard Values Used in Risk Estimation for 1-BP (Fenceline and Multi-Year Analyses)

Scenario	Endpoint	Inhalation Hazard Value (Exposure Durations)	Benchmark
Acute	Developmental: Post-implantation loss	6 ppm ^a (24 hr/day)	100
Chronic	Developmental: Post-implantation loss	6 ppm ^a (24 hr/day over 365 day/yr)	100
Cancer	Respiratory adenomas/carcinoma	6E-03 per ppm ^b (24 hr/day over 365 day/yr for 33 years)	1E-6 (Gen. Pop.)

^a The non-cancer human equivalent concentrations (HECs) were derived from the original benchmark concentration levels (BMCLs) from the animal studies as presented in Table 3-8 of the 1-BP risk evaluation. The acute and chronic HECs are for the developmental endpoint of post-implantation loss, with a BMCL₁ of 23 ppm following 6 hr/day daily inhalation exposure of pregnant rats from pre-mating through gestational day 20. In adjusting for continuous 24 hr/day exposure, the resulting HEC matches the value used for consumers in the 1-BP final risk evaluation.

^b For cancer, the IUR value used for consumers was already adjusted to continuous exposure and did not require any further extrapolation for evaluation of risks to fenceline communities.

1.1.4 Ambient Air Land Use Methodology

The land use methodology utilized geographic information systems (ESRI ArcGIS Version 10.8 and Google Maps) to characterize land use patterns within the radial distances where risk estimates are above the benchmark for cancer. This land use analysis does not include generic facilities. For facilities where residential areas, industrial/commercial businesses, or other public spaces are present within those radial distances where risk estimates are above the benchmark, EPA includes human receptors within the fenceline community category and reasonably expects an exposure will occur to fenceline communities. Where the radial distances with risk estimates above the benchmark occur within the boundaries of the facility or are limited to uninhabited areas, EPA does not expect an exposure will occur to fenceline communities.

¹⁰ General Population (Gen. Pop) refers to the total of individuals inhabiting an area or making up a whole group (as defined in the [2011 Exposure Factors Handbook](#)). For purposes of the 2022 fenceline analysis and the multi-year analysis presented herein, the general population includes, but is not limited to, residents living near a releasing facility and individuals employed at facilities that are not the releasing facility but are within the distances where calculated risk estimates are greater than the benchmark for cancer (or less than the benchmark for non-cancer).

1.2 Multi-Year Analysis

The multi-year analysis incorporates SACC recommendations by evaluating multiple years of chemical release data to estimate exposures and associated risks to fenceline communities. This is achieved by expanding upon the pre-screening methodology utilized for the 2022 fenceline analysis and conducting a facility-by-facility evaluation of all 1-BP releases reported to TRI over five reporting years (2016 through 2020). Data for these five years were obtained from the TRI database (TRI basic plus files downloaded on August 5, 2022). Annual release data for 1-BP were extracted from the entire TRI data set for all facilities reporting air releases of 1-BP for one or more years between 2016 and 2020. Facilities were categorized into occupational exposure scenarios for modeling purposes and later cross-walked to COUs for risk management purposes.

The TRI data extracted for the multi-year analysis were used as direct inputs to the IIOAC model. An additional arithmetic average of the TRI data for each facility was also calculated when the facility reported releases to TRI for two or more of the years evaluated and used as a direct input to the IIOAC model. EPA then evaluated a more “conservative exposure scenario” of the 16 scenarios evaluated for the pre-screening methodology in the 2022 fenceline analysis. This more conservative exposure scenario consists of a facility that operates year-round (365 days per year, 24 hours per day, 7 days per week), a South Coastal meteorologic region, and a rural topography setting.

A land-use analysis was conducted for the multi-year analysis utilizing the same visual methodology described for the 2022 fenceline analysis but limited to land-use around facilities where the multi-year analysis (1) found risk estimates above the benchmark value extending farther out when compared to the 2022 fenceline analysis,¹¹ or (2) identified a facility with risk estimates above the benchmark that was not captured by the 2022 fenceline analysis.¹² Using this methodology, EPA identified if there is an expected exposure of an individual to releases from the facility of interest within the distances where the benchmark was exceeded.

2 RESULTS

EPA conducted and completed three analyses of 1-BP since the draft report for the 2022 fenceline analysis was originally presented to and reviewed by the SACC in March 2022. The three analyses are

1. Pre-screening analysis in accordance with the methodology in the draft report for the 2022 fenceline analysis;
2. Full-screening analysis in accordance with the methodology in the draft report for the 2022 fenceline analysis; and
3. Multi-year analysis in accordance with the methodology described in this technical support memorandum.

¹¹ For example, a facility with risk estimates above the benchmark for cancer from 5 to 30 m based on the 2022 fenceline analysis (using 2019 TRI release data) and that same facility with risk estimates above the benchmark for cancer at 100 m based on the multi-year analysis (using releases reported to 2016 TRI that were higher than releases reported to 2019 TRI). In this situation, the land use analysis would extend out to include any land use between 30 and 100 m because the multi-year analysis had risk estimates above the benchmark for cancer that extended out to a farther distance when compared to the 2022 fenceline analysis.

¹² For example, a facility that did not have reported releases in the 2019 TRI data set used for the 2022 fenceline analysis at the time of extraction but did report releases in the 2016, 2017, 2018, and/or 2020 TRI data sets that result in risk estimates above the benchmark for cancer based on the multi-year analysis.

2.1 2022 Fenceline Analysis

The draft report for the 2022 fenceline analysis presented to the SACC included preliminary results for 1-BP for the single-year analysis. Therefore, EPA presents a summary of the results for both pre-screening and full-screening analyses for 1-BP below as well as a summary of the findings from the land use analysis for the 2022 fenceline analysis for reference.

2.1.1 Ambient Air Pre-screening Results for 1-BP

The results from the pre-screening methodology used for the 2022 fenceline analysis of 1-BP found risk estimates that exceeded the benchmark for cancer at 100 m based on the maximum single-facility 1-BP release reported in the 2019 TRI. In accordance with the 2022 fenceline methodology as presented to the SACC, because risk estimates exceeded the benchmark for cancer based on the pre-screening analysis, EPA conducted a full-screening analysis of all releasing facilities for 1-BP.

2.1.2 Ambient Air Full-Screening Results for 1-BP

The results from the full-screening methodology used for the 2022 fenceline analysis of 1-BP included 71 real or generic facilities. Risk estimates exceeded the benchmark for cancer risk for 56 of the 71 real or generic facilities at multiple distances, representing 12 of the 14 OESs.¹³ A summary of the maximum risk estimates for cancer, organized by OES, for 1-BP based on the high-end (95th percentile) exposure concentrations are presented in detail in Appendix B, Table_Apx B-1.

2.1.3 Ambient Air Land Use Results for 1-BP

The land use analysis for the 2022 fenceline analysis of 1-BP included 59 facilities with GIS information available. Of those 59 facilities with GIS information, 49 also had risk estimates above the benchmark for cancer. Therefore, the land use analysis was conducted for these 49 facilities.

Thirty-five of the 49 real facilities also had an expected exposure to fenceline communities (results summarized in Table 2-1). For example, the first OES identified in Table 2-1 is degreasing. A total of 34 facilities identified for this OES were evaluated for the 2022 fenceline analysis. Of those 34 facilities, 30 had risk estimates above the benchmark for cancer at one or more distances between 5 and 1,000 m from the respective releasing facility. Of those 30 facilities, 26 have fenceline receptors within the distances where risk estimates were above the benchmark for cancer. These receptors might include individuals residing in a home or apartment complex or individuals working at another industrial/commercial facility located beyond the property line of the releasing facility, but within the distances where risk estimates are above the benchmark for cancer. Facilities that do not have fenceline receptors, such as those facilities surrounded by an open field or when distances where risk estimates are above the benchmark for cancer remain within the property line of the releasing facility, would not be included in the fourth column of Table 2-1.

¹³ Clarification: The 2022 fenceline analysis organizes facilities (and associated risks) by OES and identified 12 OES for which there were risk estimates above the benchmark for cancer. These 12 OESs can be associated with one or more COUs as shown in the published risk evaluation for 1-BP. The multi-year analysis attempts to associate each facility with the COU category included in the published risk evaluation but does not break down COUs to the sub-category level.

Table 2-1. Land Use Analysis Results for 2022 Fenceline Analysis of 1-BP

OES ^a	Total Number of Facilities Evaluated	Number of Facilities with Risk Indicated	Number of Facilities with Risk Indicated and Exposures Expected	Percent of Total Facilities with Risk Indicated and Exposures Expected
Degreasing	34	30	26	77%
Formulation	11	9	6	55%
Import	4	4	2	50%
Other Uses-Cutting Oils	5	2	1	20%
Manufacturing	2	2	0	0%
Repackaging	1	1	0	0%
Recycling and Disposal	2	1	0	0%

^a This table is limited to facilities with specific location information. It excludes surrogate facilities and OES for which TRI data were not available.

2.2 Multi-Year Analysis

2.2.1 Ambient Air Multi-Year Results for 1-BP

Since the multi-year analysis was conducted in response to SACC recommendations, EPA presents the results for 1-BP below. The multi-year analysis only looks at real facilities with reported releases in TRI for one or more reporting years between 2016 and 2020 and does not include estimated releases from generic facilities. The model utilized for the multi-year analysis is the same model used in the pre-screening methodology presented to SACC (HIOAC) and is limited to evaluation of three distances (100, 100 to 1,000, and 1,000 m) from a releasing facility and therefore does not capture exposures occurring less than 100 m or greater than 1,000 m from the releasing facility.

As such, the multi-year analysis includes 105 real facilities and found risk estimates above the benchmark for cancer for 47 of those real facilities, at 100 m from the releasing facility. Based on the multi-year analysis, 16 of these 47 facilities either had risk estimates above the benchmark for cancer at distances farther out when compared to the 2022 fenceline analysis or were not captured in the 2022 fenceline analysis data set. A summary of the number of facilities evaluated and the number with risk estimates above the benchmark for cancer by OES and COU is provided in Table 2-2. Detailed results of this multi-year analysis are included in Appendix C, Table_Apx C-1

Table 2-2. Summary of the Number of Facilities Evaluated and with Risk Estimates Above the Benchmark for Cancer by OES and COU Based on 2022 Fenceline Analysis and Multi-Year Analysis for 1-BP

OES	COU	Total Number of Facilities		
		Evaluated ^a	Exceeding Benchmark for Cancer @ 100 m	
			2022 Fenceline Analysis ^b	Multi-Year Analysis
Asphalt Extraction	Other - asphalt extraction	1	1	1
Degreasing (Batch Vapor Degreaser (Open-Top); Batch Vapor Degreaser (Closed-Loop); In-Line Vapor Degreaser (Conveyorized); Cold Cleaner)	In-line vapor degreaser (<i>e.g.</i> , conveyorized, web cleaner)	1	1	1
	Batch vapor degreaser (<i>e.g.</i> , closed-loop)	3	2	3
	Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop)	3	2	3
	Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop); In-line vapor degreaser (<i>e.g.</i> , conveyorized, web cleaner)	36	18	23
	Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop); In-line vapor degreaser (<i>e.g.</i> , conveyorized, web cleaner); Cold cleaning	12	2	6
Dry Cleaning	Dry cleaning solvent	2	1	1
Formulation	Solvents for cleaning or degreasing in electrical equipment, appliance, and components	2	0	1
	Solvents for cleaning or degreasing in manufacturing of all other chemical product and preparations	13	2	2
	Solvents for cleaning or degreasing in manufacturing of soap, cleaning compound and toilet preparation	3	0	0
Import	Import	4	0	0
Manufacturing	Domestic Manufacture	2	1	1
Other Uses – Cutting Oils	Functional fluids (open system) - cutting oils	6	1	2
Processing as a Reactant	Intermediate in pesticide, fertilizer and other agricultural chemical manufacturing	1	0	1
Processing: Incorporation into Articles	Processing - incorporating into articles - Solvents (which become part of	2	0	2

OES	COU	Total Number of Facilities		
		Evaluated ^a	Exceeding Benchmark for Cancer @ 100 m	
			2022 Fenceline Analysis ^b	Multi-Year Analysis
	product formulation or mixture) in construction			
Recycling and Disposal	Hazardous waste incinerator	2	0	0
	Hazardous waste landfill	1	0	0
	Hazardous waste landfill; Recycling	1	0	0
	Off site waste transfer	2	0	0
	Off site waste transfer, Hazardous waste incinerator	1	0	0
	Off site waste transfer; Recycling	2	0	0
Repackaging	Repackaging - Solvent for cleaning or degreasing in all other basic organic chemical	4	0	0
Spray Adhesives	Adhesive chemicals - spray adhesive for foam cushion manufacturing and other uses	1	0	0
Total Facilities Evaluated		105	31	47
^a The number of facilities in this column represent the total number of facilities evaluated using either single-year fenceline or multi-year analysis or both ^b The number of facilities captured by the single-year fenceline analysis may deviate from the number captured by multi-year analysis since the multi-year analysis captured more facilities reporting across multiple years of data. The number of facilities indicating risk @ 100 meters for fenceline may vary from multi-year due to more site-specific inputs utilized in the fenceline approach (like local met data) and hours of operation which may still indicate risks, just at distances less than 100 meters (100 meters is the minimum distance evaluated using the model for multi-year analysis).				

2.2.2 Ambient Air Multi-Year Land Use Results for 1-BP

A follow-up land use analysis was conducted for the 16 facilities either indicating risks at distances farther out when compared to the 2022 fenceline analysis or facilities not captured by the 2022 fenceline analysis. The results found that each of these facilities had an expected exposure to fenceline communities. As with the 2022 fenceline analysis, these receptors might include individuals residing in a home or apartment complex or individuals working at another industrial/commercial facility located beyond the property line of the releasing facility, but within the distances where risk estimates are above the benchmark for cancer. Results of this analysis are summarized in Appendix D; Table_Apx D-1.

3 CLOSING REMARKS

The combined approaches used in the analyses presented in this technical support memorandum are consistent with work presented to and feedback received from the SACC. The multi-year analysis highlights the year-to-year variability that exists in the release data and illustrates the potential impact of considering multiple years of TRI data on exposure and risk estimates. The findings from the multi-year analysis provide additional confidence in the findings from the 2022 fenceline analysis for purposes of

estimating exposures and risks to fenceline communities. The multi-year analysis did not change the overall 1-BP risk profile when compared to results of the 2022 fenceline analysis, although the multi-year analysis did identify additional facilities with risk estimates above the benchmark for cancer that were not captured by the 2022 fenceline analysis data set.

3.1 Limitations and Uncertainties

The multi-year analysis is intended to be a first-tier analysis designed to expand upon the pre-screening methodology presented to the SACC by considering multiple years of TRI release data and the effects of such data on the overall exposure estimates and risk calculations evaluated for the 2022 fenceline analysis. As such the results are not comprehensive.

A complete mapping for each facility allows EPA to develop a link between each reporting facility and a COU. However, there are limitations to this approach due to the absence of sufficiently detailed facility-level use information from primary environmental release sources. In these instances, EPA identifies the associated COU to the category level in the published risk evaluation, but is not able to link the facility releases to a COU at the subcategory level because:

1. The use information in TRI is not specific enough to map to a COU at the subcategory level. For example, there may be several subcategories of use associated with solvents for degreasing. In TRI, a facility only reports the use as “degreasing.” In that case, the category is known but the subcategory or COU is unknown.
2. TRI datasets prior to 2018 do not include the sub-use information that can make it difficult to differentiate COUs that occur under similar NAICS codes. For example, a chemical used in metalworking fluids and as a degreasing solvent. Both are likely to have NAICS codes associated with metal parts production but prior to the 2018 TRI collection, the reported use information may only indicate “other ancillary use.”
3. Facilities reporting using TRI Form As do not provide use information. In these cases, EPA must make an inference using the NAICS code and possibly supplemental facility information from internet searches. Consequently, the NAICS code may be enough for a reasonable assumption regarding the category of use but not sufficient for the subcategory of use or COU.

There are also some limitations and uncertainties associated with the release data utilized in the multi-year analysis, including potential year-to-year revisions to reported releases within the TRI database and the number of individual facilities reporting to the TRI. These limitations and uncertainties may result in changes to the

1. facilities mapped to any OES;
2. total volume of releases per OES;
3. distribution and volume of releases to stack and fugitive emissions; and/or
4. universe of OES’s previously mapped and captured.

These changes may subsequently result in changes to the release and exposure assessments as well as associated risk estimates.

Further, certain assumptions and uncertainties related to the model used for the multi-year analysis can impact conclusions and limit direct comparison to the 2022 fenceline analysis including, but not limited to, the following:

1. use of default meteorological data incorporated into the IIOAC model which may differ from the meteorological data used for the 2022 fenceline analysis;
2. emission scenario used for the multi-year analysis may not represent the actual operating conditions or location used in the 2022 fenceline analysis; and

3. Default stack parameters used for the multi-year analysis may not represent actual stack parameters or conditions of the modeled facility.

The multi-year analysis applied the same modeling parameters across all years of facility-specific release data. Although broad comparisons may be made regarding the impact of multi-year releases on exposure concentrations and associated risk estimates, a direct comparison between the 2022 fenceline analysis and the multi-year analysis results is marginal at best because certain components and assumptions used for either analysis can impact the overall estimated exposure concentrations and associated risk estimates.

Appendix A Pre-screening Exposure Scenarios for 2022 Fenceline Analysis

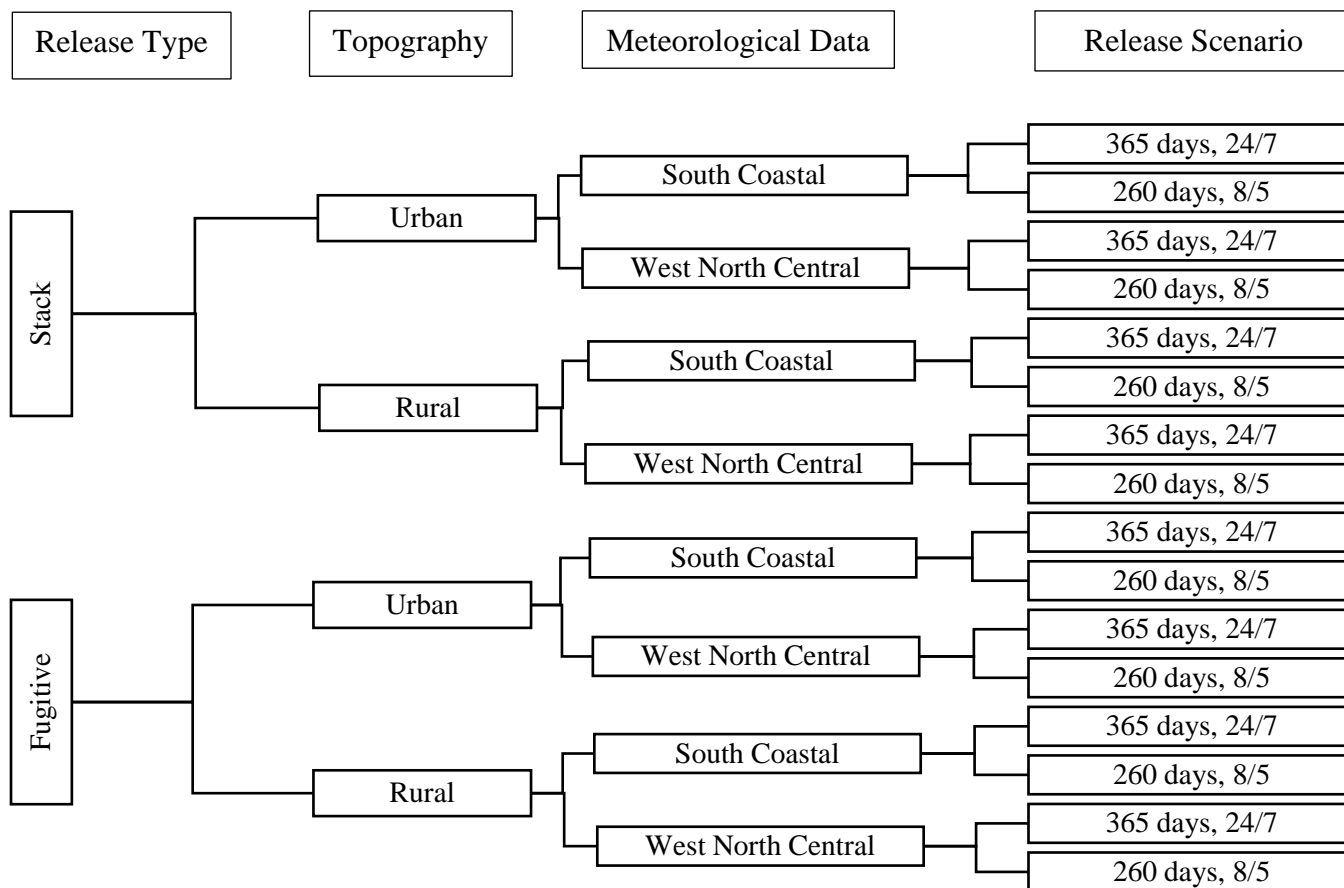


Figure A-1. Pre-screening Exposure Scenarios Modeled Using IIOAC Model for 1-BP: Maximum and Mean Releases

Appendix B Results Summary for 2022 Fenceline Analysis

Table_Apx B-1. Risk Estimates for Cancer for 1-BP Based on the High-End Exposure Concentrations (95th Percentile) for 2022 Fenceline Analysis

OES	Number of Real or Generic Facilities		Maximum Extra Risk Estimate for Cancer Across Facilities within OES by Distance (m) (Based on 95th Percentile LADC)								
	Evaluated	With Risk Estimates Greater than Benchmark	5	10	30	60	100	100 to 1,000	2,500	5,000	10,000
Aerosol Spray Degreaser/Cleaner	1	1	7.82E-06	9.85E-06	2.74E-06	8.83E-07	3.30E-07	2.09E-08	5.33E-10	1.72E-10	6.83E-11
Asphalt Extraction	1	1	7.31E-05	1.72E-04	9.47E-05	4.11E-05	2.15E-05	2.14E-06	1.62E-07	5.41E-08	1.79E-08
Degreasing	34	27	1.66E-03	2.09E-03	6.14E-04	2.11E-04	8.83E-05	7.64E-06	3.60E-07	1.17E-07	4.62E-08
Dry-Cleaning	6	6	3.48E-05	4.34E-05	1.47E-05	5.74E-06	2.64E-06	2.67E-07	1.38E-08	4.82E-09	1.68E-09
Formulation	11	9	2.97E-05	4.11E-05	2.04E-05	8.66E-06	4.24E-06	4.37E-07	2.27E-08	7.34E-09	2.40E-09
Import	4	4	3.96E-06	4.95E-06	1.45E-06	4.80E-07	1.74E-07	1.33E-08	1.93E-10	7.01E-11	3.35E-11
Incorporation into Articles	1	1	1.28E-05	1.40E-05	4.42E-06	1.71E-06	8.28E-07	1.37E-07	7.79E-09	2.64E-09	8.88E-10
Manufacturing	2	2	1.03E-04	1.39E-04	5.31E-05	2.13E-05	1.00E-05	1.18E-06	6.24E-08	2.22E-08	8.05E-09
Other Uses-Cutting Oils	5	2	4.29E-05	4.75E-05	1.50E-05	5.53E-06	2.47E-06	1.98E-07	1.14E-08	3.66E-09	1.18E-09
Processing as a Reactant	1	1	9.16E-06	1.44E-05	5.84E-06	2.33E-06	1.08E-06	1.28E-07	4.92E-09	1.61E-09	5.33E-10
Recycling and Disposal	2	0	3.50E-07	6.02E-07	3.00E-07	1.23E-07	6.07E-08	8.73E-09	3.50E-10	1.17E-10	3.93E-11
Repackaging	1	1	1.57E-06	2.06E-06	5.89E-07	1.90E-07	6.93E-08	4.62E-09	9.19E-11	3.55E-11	1.80E-11
Spot Cleaner/Stain Remover	1	1	1.71E-06	2.20E-06	6.17E-07	2.00E-07	7.46E-08	5.28E-09	1.17E-10	3.76E-11	1.42E-11
Spray Adhesives	1	0	1.27E-13	1.63E-11	6.30E-09	5.97E-08	1.10E-07	2.61E-08	7.36E-10	2.82E-10	1.29E-10
Total	71	56									

Appendix C Results Summary Comparison for 2022 Fenceline Analysis and Multi-Year Analysis at 100 m from Releasing Facility

Table_Apx C-1. Risk Estimates for Cancer at 100 m from Releasing Facility for 1-BP Based on Estimated High-End and Central Tendency Exposure Concentrations

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c						
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average	
Asphalt Extraction	Other - asphalt extraction	78410KCHRFSUNTI	CT	5 to 100	6.32E-06	2.14E-05	4.15E-07					1.09E-05
			HE	5 to 1000	2.15E-05	2.34E-05	4.76E-07					1.19E-05
Degreasing (Batch Vapor Degreaser (Open-Top); Batch Vapor Degreaser (Closed-Loop); In-Line Vapor Degreaser (Conveyorized); Cold Cleaner)	In-line vapor degreaser (e.g., conveyorized, web cleaner)	60123LGLYN1565F	CT	5 to 100	1.07E-05		4.80E-05	4.12E-05	3.89E-05	1.81E-05	3.66E-05	
			HE	5 to 1000	1.90E-05		5.24E-05	4.50E-05	4.25E-05	1.98E-05	3.99E-05	
	Batch vapor degreaser (e.g., closed-loop)	06098WNSTD249RO	CT				1.98E-06	3.64E-06			2.81E-06	
			HE				2.16E-06	3.97E-06			3.07E-06	
	06813THBRD200PA	CT	5 to 100	2.27E-06	3.59E-06	3.92E-06	8.22E-06	6.42E-06	8.54E-06	6.14E-06		
		HE	5 to 100	4.98E-06	3.92E-06	4.29E-06	8.98E-06	7.01E-06	9.32E-06	6.71E-06		
	67277BNGML3801S	CT	5 to 100	1.66E-06	9.96E-06	8.63E-06	8.72E-06	6.96E-06	7.66E-06	8.39E-06		
		HE	5 to 100	4.21E-06	1.09E-05	9.42E-06	9.52E-06	7.60E-06	8.37E-06	9.16E-06		
	Batch vapor degreaser (e.g., open-top, closed-loop)	07928NTNLM12RIV	CT	5 to 30	6.12E-07	1.21E-06	1.29E-06	1.20E-06	1.17E-06	9.09E-07	1.16E-06	
			HE	5 to 60	9.67E-07	1.34E-06	1.43E-06	1.33E-06	1.29E-06	1.01E-06	1.28E-06	
	53212RTSTC428WV	CT	5 to 100	4.75E-06	1.61E-05	1.49E-05	1.42E-05	1.49E-05	1.56E-05	1.51E-05		
		HE	5 to 100	5.84E-06	1.76E-05	1.63E-05	1.55E-05	1.63E-05	1.71E-05	1.65E-05		
	77041DMVST12050	CT	100	1.51E-06				8.20E-07	9.57E-08	4.58E-07		

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
			HE	100 to 1000	2.11E-06				9.40E-07	1.10E-07	5.25E-07
	Batch vapor degreaser (e.g., open-top, closed-loop); In-line vapor degreaser (e.g., conveyORIZED, web cleaner)	0196WSYNVN1CENT	CT			5.05E-09					5.05E-09
HE					5.52E-09					5.52E-09	
		05201TNSTRWESTR	CT		3.68E-08	3.01E-08	2.78E-08	3.36E-08	3.76E-08	3.08E-08	3.20E-08
HE				6.83E-08	3.42E-08	3.16E-08	3.83E-08	4.28E-08	3.50E-08	3.64E-08	
		14432GWLSK2SOUT	CT			8.39E-07	8.05E-07	2.97E-07	2.92E-07	3.01E-07	5.07E-07
HE					9.16E-07	8.79E-07	3.25E-07	3.19E-07	3.29E-07	5.54E-07	
		15557RCKWD300MA	CT				8.65E-06	1.13E-05			9.97E-06
HE						9.44E-06	1.23E-05			1.09E-05	
		15857KYSTN1935S	CT		2.13E-07	2.87E-07	2.35E-07	3.48E-07	1.98E-07		2.67E-07
HE				5.28E-07	3.29E-07	2.69E-07	3.99E-07	2.27E-07		3.06E-07	
		1680WGNRLD6DECI	CT			2.78E-07					2.78E-07
HE					3.05E-07					3.05E-07	
		19046SPSTCHIGHL	CT	5 to 100	3.58E-06	1.17E-05	1.17E-05	1.16E-05	1.01E-05	4.72E-06	9.96E-06
HE			5 to 100	5.03E-06	1.28E-05	1.27E-05	1.27E-05	1.10E-05	5.15E-06	1.09E-05	
		19426SPRRT3900G	CT	5 to 100	1.07E-05	3.38E-05	1.66E-05	1.56E-05	1.62E-05	1.77E-05	2.00E-05
HE			5 to 1000	1.58E-05	3.70E-05	1.83E-05	1.72E-05	1.79E-05	1.95E-05	2.20E-05	
		28150CRTSS201OL	CT	5 to 100	1.71E-05	3.01E-05	4.89E-05	3.88E-05	3.63E-05	2.48E-05	3.58E-05
HE			5 to 1000	4.26E-05	3.28E-05	5.34E-05	4.24E-05	3.96E-05	2.71E-05	3.91E-05	

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
		35207MRCNC2930N	CT	5 to 100	5.89E-06	1.34E-05	2.02E-05	1.46E-05	1.41E-05	1.42E-05	1.53E-05
			HE	5 to 1000	1.11E-05	1.46E-05	2.21E-05	1.60E-05	1.54E-05	1.55E-05	1.67E-05
		43416BRSHWSOUTH	CT	5 to 100	5.36E-06	1.13E-05	9.69E-06	1.74E-05	1.64E-05	1.47E-05	1.39E-05
			HE	5 to 1000	9.82E-06	1.24E-05	1.06E-05	1.90E-05	1.79E-05	1.60E-05	1.52E-05
		4406WMTLSL8687T	CT		1.54E-07		3.97E-08	3.97E-08	1.93E-07		9.08E-08
			HE		3.55E-07		4.55E-08	4.55E-08	2.21E-07		1.04E-07
		46071STLCP1217W	CT	5 to 100	3.88E-06		8.03E-06	8.62E-06	1.08E-05	1.13E-05	9.67E-06
			HE	5 to 100	7.64E-06		8.76E-06	9.41E-06	1.18E-05	1.23E-05	1.06E-05
		47903FRFLDUS52B	CT			1.29E-05	1.29E-05	9.30E-06			1.17E-05
			HE			1.41E-05	1.41E-05	1.02E-05			1.28E-05
		49858LJNSC12003	CT		1.40E-07		1.58E-07	1.72E-07	1.79E-07	1.75E-07	1.71E-07
			HE		2.44E-07		1.81E-07	1.97E-07	2.05E-07	2.01E-07	1.96E-07
		55104CPRTV1605I	CT							3.00E-07	3.00E-07
			HE							3.44E-07	3.44E-07
		60007MGNTC1401G	CT		3.66E-07	3.46E-07	4.04E-07	3.30E-07	3.22E-07	2.97E-07	3.40E-07
			HE		5.94E-07	3.96E-07	4.63E-07	3.78E-07	3.69E-07	3.40E-07	3.89E-07
		60067RLNGT600SO	CT	5 to 100	7.77E-06	2.26E-05	2.32E-05	2.56E-05	2.38E-05	2.73E-05	2.45E-05
			HE	5 to 1000	1.01E-05	2.47E-05	2.54E-05	2.80E-05	2.60E-05	2.99E-05	2.68E-05
		60102WCNDT821WE	CT		1.41E-07			1.45E-07	2.27E-07	2.16E-07	1.96E-07

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
			HE		2.61E-07			1.61E-07	2.55E-07	2.42E-07	2.19E-07
		60103FLXNC300ED	CT	5 to 100	6.88E-06	1.36E-05	9.75E-06	1.67E-05	2.53E-05	2.60E-05	1.83E-05
			HE	5 to 1000	1.21E-05	1.48E-05	1.06E-05	1.82E-05	2.76E-05	2.83E-05	1.99E-05
		60131SLNVL10500	CT	5 to 100	5.43E-06	8.31E-07	1.26E-06	1.41E-06	1.98E-05	2.36E-05	9.38E-06
			HE	5 to 100	8.71E-06	9.33E-07	1.42E-06	1.59E-06	2.16E-05	2.58E-05	1.03E-05
		60152RNLDN300WE	CT	5 to 100	1.27E-06	1.05E-06	1.80E-06	3.08E-06	2.88E-06	2.18E-06	2.20E-06
			HE	5 to 100	2.24E-06	1.16E-06	1.98E-06	3.40E-06	3.17E-06	2.41E-06	2.42E-06
		60202CNHFF221LE	CT	5 to 100	3.60E-06		1.49E-05	1.46E-05	1.31E-05		1.42E-05
			HE	5 to 100	5.76E-06		1.62E-05	1.59E-05	1.43E-05		1.55E-05
		60559MRCNC40CHE	CT		2.46E-07				2.03E-07	1.16E-07	1.60E-07
			HE		4.21E-07				2.33E-07	1.33E-07	1.83E-07
		61010QLTYM4THAN	CT	5 to 100	1.16E-05	3.63E-05	4.13E-05	3.47E-05	3.30E-05	3.86E-05	3.68E-05
			HE	5 to 1000	1.94E-05	3.96E-05	4.51E-05	3.79E-05	3.60E-05	4.21E-05	4.02E-05
		67337SFTYKHWY16	CT							8.06E-06	8.06E-06
			HE							8.84E-06	8.84E-06
		72764MRCNT1603F	CT	5 to 1000	2.77E-05	7.01E-05	8.53E-05	1.01E-04	7.74E-05	5.09E-05	7.70E-05
			HE	5 to 1000	6.52E-05	7.66E-05	9.31E-05	1.11E-04	8.45E-05	5.56E-05	8.41E-05
		72830GRNVLLUCAS	CT				7.53E-06	8.38E-06	1.58E-06	4.92E-09	4.37E-06
			HE				8.26E-06	9.19E-06	1.81E-06	5.38E-09	4.82E-06

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c						
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average	
		74117LRCRP6930N	CT				0.00E+00	0.00E+00			0.00E+00	
			HE				0.00E+00	0.00E+00			0.00E+00	
		80504PRCSN74WEL	CT	5 to 60	6.47E-07			2.74E-06	1.79E-06	0.00E+00	1.51E-06	
			HE	5 to 60	7.31E-07			3.00E-06	1.96E-06	0.00E+00	1.65E-06	
		84403WLLMS3450S	CT			8.86E-06	8.86E-06	2.46E-07			5.99E-06	
			HE			9.68E-06	9.68E-06	2.69E-07			6.54E-06	
		98032HYTKF8202S	CT	5 to 100	3.81E-06	9.07E-06	9.18E-06	6.03E-06	1.20E-05		9.08E-06	
			HE	5 to 100	7.87E-06	9.91E-06	1.00E-05	6.59E-06	1.31E-05		9.91E-06	
		98032PRTCT1215N	CT			5.12E-07	5.60E-07	5.86E-07	5.78E-07	3.74E-07	5.22E-07	
			HE			5.86E-07	6.41E-07	6.71E-07	6.62E-07	4.28E-07	5.97E-07	
		98032XTCMT5411S	CT	5 to 100	4.62E-06	3.09E-05	2.59E-05	1.79E-05	1.45E-05	1.50E-05	2.08E-05	
			HE	5 to 100	9.49E-06	3.37E-05	2.83E-05	1.95E-05	1.59E-05	1.63E-05	2.28E-05	
		98033WSTRN8356T	CT	5 to 1000	3.83E-05	1.03E-04	8.33E-05	9.55E-05	1.16E-04	5.91E-05	9.14E-05	
			HE	5 to 1000	8.83E-05	1.13E-04	9.10E-05	1.04E-04	1.26E-04	6.45E-05	9.98E-05	
		98103SKPRC434N3	CT	5 to 100	5.66E-06			1.02E-05	1.71E-05	1.43E-05	1.39E-05	
			HE	5 to 1000	1.31E-05			1.12E-05	1.87E-05	1.56E-05	1.52E-05	
		Batch vapor degreaser (e.g., open-top, closed-loop); In-line vapor	17331SKFBRRD3BO	CT							9.61E-06	9.61E-06
				HE							1.05E-05	1.05E-05
	23237RYNLD1901R		CT					1.42E-05			1.42E-05	

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
	degreaser (e.g., conveyORIZED, web cleaner); Cold cleaning		HE					1.55E-05			1.55E-05
		37801NPPND1720R	CT	5 to 30	2.11E-07				0.00E+00		
			HE	5 to 30	3.99E-07				0.00E+00		
		4406WMTLSL7333C	CT			1.93E-08					1.93E-08
			HE			2.21E-08					2.21E-08
		44657PCCRF3860U	CT			1.50E-06	1.66E-06				1.58E-06
			HE			1.63E-06	1.81E-06				1.72E-06
		45631FDRLM2160E	CT			7.39E-07	0.00E+00				3.69E-07
			HE			8.06E-07	0.00E+00				4.03E-07
		46036LSCR1240S	CT	100	1.06E-06	4.92E-07	1.84E-06	1.08E-06	1.38E-06	8.90E-07	1.14E-06
			HE	100	2.27E-06	5.38E-07	2.10E-06	1.24E-06	1.58E-06	1.02E-06	1.30E-06
		48178QNXMC400MC	CT			7.88E-07	9.85E-09				3.99E-07
			HE			8.60E-07	1.08E-08				4.35E-07
		50022JPTRNWESTH	CT	5 to 60	8.33E-07	3.31E-06	1.39E-05	9.99E-06	2.20E-06	1.91E-06	6.25E-06
			HE	5 to 100	2.29E-06	3.63E-06	1.51E-05	1.09E-05	2.43E-06	2.11E-06	6.85E-06
		71701TLNTCWALTO	CT			1.77E-07					1.77E-07
			HE			2.03E-07					2.03E-07
		7261WDCMMN81CHB	CT			9.40E-06					9.40E-06
			HE			1.03E-05					1.03E-05

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c							
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average		
		87107GNRLT1450M	CT			0.00E+00						0.00E+00	
			HE			0.00E+00						0.00E+00	
Dry Cleaning	Dry cleaning solvent	unknown	CT	5 to 30	2.92E-07								
			HE	5 to 60	4.77E-07								
		unknown	CT	5 to 60	6.80E-07								
			HE	5 to 100	1.06E-06								
Formulation	Solvents for cleaning or degreasing in electrical equipment, appliance and components	68521MLXNC700KI	CT			3.26E-07	9.20E-06	1.29E-05	6.85E-05	8.70E-05	3.56E-05		
			HE			3.74E-07	1.00E-05	1.41E-05	7.48E-05	9.50E-05	3.89E-05		
		9880WSRPXX434LD	CT								4.92E-09	4.92E-09	
			HE								5.38E-09	5.38E-09	
	Solvents for cleaning or degreasing in manufacturing of all other chemical product and preparations	02370TCCNTAIRST	CT				7.80E-11	1.04E-10				9.10E-11	
			HE				8.94E-11	1.19E-10				1.04E-10	
		18974CRCCH885LO	CT	5 to 30	2.84E-07	4.33E-08	6.44E-07	6.38E-07	5.00E-07	6.24E-07	4.90E-07		
			HE	5 to 60	4.77E-07	4.73E-08	7.03E-07	6.97E-07	5.46E-07	6.82E-07	5.35E-07		
		24501SLCMC1409B	CT	5 to 60	6.04E-07	1.19E-06	1.48E-07	3.70E-07	9.23E-07	7.63E-07	6.80E-07		
			HE	5 to 100	1.09E-06	1.30E-06	1.61E-07	4.04E-07	1.01E-06	8.33E-07	7.42E-07		
		29625FBRCH1704D	CT	5 to 100	1.83E-06	3.17E-06	2.88E-06	2.52E-06	2.40E-06	1.58E-06	2.51E-06		
			HE	5 to 100	4.24E-06	3.47E-06	3.14E-06	2.75E-06	2.62E-06	1.73E-06	2.74E-06		
	30144CHMTR1825C	CT						0.00E+00	5.05E-09	2.53E-09			

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c						
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average	
			HE						0.00E+00	5.52E-09	2.76E-09	
		30701PHNXC22GEE	CT				2.70E-08	2.71E-08			2.70E-08	
			HE				3.09E-08	3.11E-08			3.10E-08	
		3070WPSGFN14EXE	CT		1.79E-08				1.86E-08	2.94E-08	2.40E-08	
			HE			2.74E-08				2.13E-08	3.37E-08	2.75E-08
		30720CTCHN310BR	CT	5 to 30	4.42E-07				6.45E-09	0.00E+00		3.23E-09
			HE	5 to 60		8.63E-07				7.08E-09	0.00E+00	
		44146SPRYN26300	CT		1.91E-08	2.27E-08	3.78E-08	2.92E-08	4.75E-08			3.43E-08
			HE			3.78E-08	2.49E-08	4.15E-08	3.21E-08	5.22E-08		
		4650WCHMTC51BLM	CT	5 to 30	2.67E-07			4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 60		5.03E-07			5.38E-07	5.38E-07	5.38E-07	5.38E-07
		60090PRCYH430SO	CT	5 to 10	1.17E-07				2.46E-07	2.46E-07	2.46E-07	2.46E-07
			HE	5 to 10		1.47E-07				2.69E-07	2.69E-07	2.69E-07
		6016WNVRTC18N25	CT	5 to 10	1.09E-07	2.44E-08	2.44E-08	2.44E-08	2.66E-07	2.66E-07	2.66E-07	1.21E-07
			HE	5 to 10		1.71E-07	2.77E-08	2.77E-08	2.77E-08	2.91E-07	2.91E-07	1.33E-07
		76031SCHMN2311P	CT	5 to 30	1.83E-07			4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 60		6.70E-07			5.38E-07	5.38E-07	5.38E-07	5.38E-07
	Solvents for cleaning or degreasing in	01570SHLDPPETER	CT					1.67E-08				1.67E-08
			HE						1.83E-08			

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
	manufacturing of soap, cleaning compound and toilet preparation	37211PLMCM430HA	CT				4.92E-07	4.92E-07			4.92E-07
			HE				5.38E-07	5.38E-07			5.38E-07
		77833CLNRS2001E	CT		6.07E-08	5.87E-08	4.82E-08	8.70E-08	1.12E-07	7.87E-08	7.70E-08
			HE	10	1.45E-07	6.43E-08	5.28E-08	9.53E-08	1.23E-07	8.62E-08	8.43E-08
Import	Import	3713WSPRRS518SW	CT	5 to 30	1.23E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 30	1.59E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07
		46225SPRRL400WR	CT	5 to 10	8.91E-08	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 30	1.74E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07
		6301WSPRRS323AR	CT	5 to 10	1.03E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 30	1.50E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07
		65803SPRRF2055E	CT	5 to 10	9.16E-08	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 30	1.49E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07	5.38E-07
Manufacturing	Domestic manufacture	71731GRTLKHIGHW	CT	5 to 60	4.44E-07			4.92E-07	4.92E-07	4.92E-07	4.92E-07
			HE	5 to 60	7.23E-07			5.38E-07	5.38E-07	5.38E-07	5.38E-07
		71753THYLCROUTE	CT	5 to 100	6.14E-06	5.38E-06	5.67E-06	5.67E-06	6.74E-06	6.74E-06	6.04E-06
			HE	5 to 1000	1.00E-05	5.88E-06	6.20E-06	6.20E-06	7.37E-06	7.36E-06	6.60E-06
Other Uses - Cutting Oils	Functional fluids (open system) - cutting oils	14870CRNNGADDIA	CT		4.44E-09	5.05E-09	5.05E-09	5.05E-09	5.05E-09	5.05E-09	5.05E-09
			HE		1.07E-08	5.52E-09	5.52E-09	5.52E-09	5.52E-09	5.52E-09	5.52E-09
		17404MZCRP1600P	CT	5 to 60	7.72E-07	1.24E-05	5.13E-07	1.53E-06	1.44E-06	1.26E-06	3.42E-06

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
			HE	5 to 100	2.47E-06	1.35E-05	5.60E-07	1.67E-06	1.57E-06	1.38E-06	3.74E-06
		21230KYDNR1400B	CT		2.15E-08	2.91E-09	3.22E-08	3.22E-08	1.19E-08	7.96E-09	1.74E-08
			HE		3.60E-08	3.34E-09	3.69E-08	3.69E-08	1.36E-08	9.12E-09	2.00E-08
		27886KHNCR4047M	CT			1.33E-06	3.68E-06	1.46E-06			2.15E-06
			HE			1.46E-06	4.03E-06	1.61E-06			2.37E-06
		3272WFLMTL81FLI	CT	5 to 30	2.24E-07		6.26E-07	5.37E-07	2.95E-07	1.59E-07	4.04E-07
			HE	5 to 30	3.88E-07		6.84E-07	5.87E-07	3.22E-07	1.73E-07	4.41E-07
		6402WFRcnt25NEJ	CT		2.27E-08				5.10E-08	5.10E-08	5.10E-08
			HE		3.53E-08				5.57E-08	5.57E-08	5.57E-08
Processing as a Reactant	Intermediate in pesticide, fertilizer and other agricultural chemical manufacturing	48667THDWCmichi	CT			1.38E-06	1.38E-06	1.18E-06			1.31E-06
			HE			1.51E-06	1.51E-06	1.29E-06			1.43E-06
Processing: Incorporation into Articles	Processing - incorporating into articles - Solvents (which become part of product formulation or mixture) in construction	08110CLTXC1500J	CT			1.07E-06	1.19E-06	1.16E-06	1.13E-06	9.97E-07	1.11E-06
			HE			1.17E-06	1.30E-06	1.27E-06	1.24E-06	1.09E-06	1.21E-06
		61920THCLT1255N	CT							3.08E-06	3.08E-06
			HE							3.37E-06	3.37E-06
		29059SNTCmschwy	CT					2.60E-11		8.74E-11	5.67E-11

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c						
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average	
Recycling and Disposal	Hazardous waste incinerator	71730NVRNM309AM	HE					2.98E-11		9.70E-11	6.34E-11	
			CT						2.60E-12	2.60E-12		
			HE						2.98E-12	2.98E-12		
	Hazardous waste landfill	78380TXSCLPETRO	CT				0.00E+00				0.00E+00	
			HE				0.00E+00				0.00E+00	
	Hazardous waste landfill; Recycling	89003SCLGYHWY95	CT			9.91E-10	4.30E-10	6.71E-10			6.98E-10	
			HE			1.09E-09	4.72E-10	7.38E-10			7.65E-10	
	Off site waste transfer	47331RCLMD1500W	CT		2.30E-08	1.56E-08	1.43E-07	3.94E-07	3.97E-08	2.07E-08	1.23E-07	
			HE		3.60E-08	1.71E-08	1.56E-07	4.30E-07	4.33E-08	2.26E-08	1.34E-07	
		98421BRLNG1701E	CT								0.00E+00	0.00E+00
			HE								0.00E+00	0.00E+00
	Off site waste transfer, Hazardous waste incinerator	46135LNSTRPUTNA	CT		4.29E-08	7.62E-08	6.63E-08	6.58E-08	6.38E-08	1.30E-08	5.70E-08	
			HE		6.07E-08	8.32E-08	7.24E-08	7.19E-08	6.97E-08	1.42E-08	6.23E-08	
	Off site waste transfer; Recycling	43025SFTYK581MI	CT								0.00E+00	0.00E+00
			HE								0.00E+00	0.00E+00
		54701WRRNV5200S	CT			8.77E-08	3.33E-08	2.44E-08	3.65E-07	4.25E-07	1.87E-07	
HE					9.58E-08	3.65E-08	2.70E-08	3.99E-07	4.64E-07	2.04E-07		
Repackaging		0605WMCRCR595JH	CT	5 to 10	3.93E-08	1.58E-07	1.58E-07	2.37E-07	1.91E-07	3.42E-08	1.56E-07	

OES	COU	Facility TRI-FID	Statistic	2022 Fenceline Analysis ^a		Multi-Year Analysis ^c					
				Distance with Risk Estimates above Benchmark ^b	Risk Estimate @ 100 m	2016	2017	2018	2019	2020	Arithmetic Average
	Repackaging - Solvent for cleaning or degreasing in all other basic organic chemical	40216SPRRS4211B	HE	5 to 10	6.93E-08	1.72E-07	1.72E-07	2.59E-07	2.09E-07	3.74E-08	1.70E-07
			CT			4.92E-07	4.92E-07	4.92E-07			4.92E-07
		60031MZRCH3938P	HE			5.38E-07	5.38E-07	5.38E-07			5.38E-07
			CT				2.60E-10	2.13E-09		0.00E+00	7.96E-10
		63139CHMSP211CL	HE				2.98E-10	2.32E-09		0.00E+00	8.73E-10
			CT			4.92E-07					4.92E-07
		HE			5.38E-07						5.38E-07
		Spray Adhesives	Adhesive chemicals - spray adhesive for foam cushion manufacturing and other uses	unknown	CT		5.97E-08				
HE					1.10E-07						

^a Where both columns under the 2022 Fenceline Analysis header are blank, the single year fenceline analysis did not capture the specific facility identified and therefore there was no single-year analysis for that facility. (single-year only used 2019 data and therefore, if a facility captured by multi-year did not report to TRI in 2019 then it would not have any data for evaluation under the single-year analysis)

^b Where only the “distance with risk estimates above benchmark” column is blank (and a value is in the “risk estimate @100 m”) under 2022 Fenceline Analysis, the single year analysis did evaluate the facility but did not have any risk estimates (at any distance) exceeding relevant benchmarks.

^c Where one or more years under the multi-year analysis column header is blank, a release was not reported to TRI for that calendar year and therefore EPA was unable to evaluate that year for the given facility.

Appendix D Land Use Analysis for Facilities Identified by Multi-Year Analysis that Were Not Included in the 2022 Fenceline Analysis

Table_Apx D-1. Land Use Analysis Results for Multi-Year Analysis of 1-BP at 1,000 m^a

OES	COU	TRI-FID	Risk Estimates above the Benchmark for Cancer and Exposure to Fenceline Communities
Degreasing (Batch Vapor Degreaser (Open-Top); Batch Vapor Degreaser (Closed-Loop); In-Line Vapor Degreaser (Conveyorized); Cold Cleaner)	Batch vapor degreaser (<i>e.g.</i> , closed-loop)	06098WNSTD249RO	Y
	Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop)	07928NTNLM12RIV	Y
	Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop); In-line vapor degreaser (<i>e.g.</i> , conveyorized, web cleaner)	15557RCKWD300MA	Y
		47903FRFLDUS52B	Y
		72830GRNVLLUCAS	Y
		80504PRCSN74WEL	Y
		84403WLLMS3450S	Y
		Batch vapor degreaser (<i>e.g.</i> , open-top, closed-loop); In-line vapor degreaser (<i>e.g.</i> , conveyorized, web cleaner); Cold cleaning	17331SKFBRRD3BO
	23237RYNLD1901R		Y
	44657PCCRF3860U		Y
	7261WDCMMN81CHB		Y
	Formulation	Solvents for cleaning or degreasing in electrical equipment, appliance, and components	68521MLXNC700KI
Other Uses - Cutting Oils	Functional fluids (open system) – cutting oils	27886KHNCR4047M	Y
Processing as a Reactant	Intermediate in pesticide, fertilizer, and other agricultural chemical manufacturing	48667THDWCMICHI	Y
Processing: Incorporation into Articles	Processing – incorporating into articles - Solvents (which become part of product formulation or mixture) in construction	08110CLTXC1500J	Y
		61920THCLT1255N	Y
<p>^a Each listed facility listed showed cancer risk above the benchmark at a distance of 100 m from the facility. To account for uncertainty between the modeled distances, the land use analysis looked at additional modeled distance out (in this case, 1,000 m).</p>			