

# CLEANER AIR OREGON RISK ASSESSMENT WORK PLAN

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HYDRO EXTRUSION PORTLAND, INC.  
PORTLAND, OREGON



*Prepared for*  
**OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY**  
*May 30, 2023*  
*Project No. M0201.10.002*

*Prepared by*  
*Maul Foster & Alongi, Inc.*  
*6 Centerpointe Drive, Suite 360, Lake Oswego, OR 97035*

# CONTENTS

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TABLES III

ACRONYMS AND ABBREVIATIONS	IV
1 INTRODUCTION	1
2 CONCEPTUAL SITE MODEL	2
2.1 SIGNIFICANT TEUS	2
2.2 GAS COMBUSTION TEUS	2
2.3 AGGREGATED TEUS	2
3 EXPOSURE ASSESSMENT	3
3.1 LAND-USE ZONING CLASSIFICATION—EXPOSURE TYPES	3
3.2 EXPOSURE PATHWAYS	3
4 RISK CHARACTERIZATION	3
4.1 RISK-BASED CONCENTRATIONS	3
4.2 RISK ESTIMATES	3
4.3 NONCANCER RISK ACTION LEVELS	4
5 UNCERTAINTY ANALYSIS	5
6 CLOSING	7

LIMITATIONS

TABLES

## TABLES

Table 1-1	CAO Process Step Submittals and Approvals
Table 4-1	Applicable Risk-Based Concentrations (Attached)
Table 4-2	Revisions to the Noncancer Hazard Index Risk Action Levels
Table 5-1	List of TACs With No Published Risk-Based Concentrations (Attached)

## ACRONYMS AND ABBREVIATIONS

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CAO	Cleaner Air Oregon
DEQ facility	Oregon Department of Environmental Quality coatings facility located at 5325 Skyport Way in Portland, Oregon
g/s	grams per second
Hydro	Hydro Extrusion Portland, Inc.
MFA	Maul Foster & Alongi, Inc.
OAR	Oregon Administrative Rule
Protocol	Revised Cleaner Air Oregon Modeling Protocol submitted January 9, 2023
RAL	risk action level
RAWP	Level 3 Risk Assessment Work Plan
RBC	risk-based concentration
TAC	toxic air contaminant
TEU	toxic emissions unit
ug/m <sup>3</sup>	micrograms per cubic meter

# 1 INTRODUCTION

Hydro Extrusion Portland, Inc. (Hydro) owns and operates a coatings facility located at 5325 NE Skyport Way in Portland, Oregon (the “facility”). The facility currently operates under Standard Air Contaminant Discharge Permit No. 26-3241-ST-01 issued by the Oregon Department of Environmental Quality (DEQ) on November 21, 2018.

Hydro has completed the Cleaner Air Oregon (CAO) permitting program requirements presented in Table 1-1. Each requirement is presented with the date of Hydro’s submittal and the corresponding date of DEQ approval.

**Table 1-1. CAO Process Step Submittals and Approvals**

CAO Requirement	Submittal Date	DEQ Approval Date
CAO Emissions Inventory	February 12, 2021 (Revised March 19, 2021) (Revised July 6, 2021) (Revised February 10, 2022) (Revised May 30, 2023)	May 20, 2022
CAO Modeling Protocol	June 19, 2022 (Revised January 9, 2023) (Revised May 30, 2023)	January 30, 2023
CAO Risk Assessment Work Plan	July 14, 2022 (Revised January 9, 2023) (Revised May 30, 2023)	January 30, 2023

Hydro has retained Maul Foster & Alongi, Inc. (MFA) to assist the facility with the dispersion modeling and risk assessment component of the CAO permitting program. Hydro intends to conduct a Level 3 Risk Assessment to estimate the potential excess cancer risk and chronic and acute noncancer risk (expressed numerically as the chronic and acute hazard indices) impacts from the facility for comparison to the applicable risk action levels (RALs) shown in Oregon Administrative Rule (OAR) 340-245-8010 Table 1.

As stated in OAR 340-245-0030(1)(c), a Level 3 Risk Assessment work plan (RAWP) must be submitted to the DEQ no later than 60 days after receiving DEQ approval of the CAO emission inventory. This requirement was met, as shown in Table 1.1. This revised RAWP references the revised toxic air contaminant (TAC) emissions inventory and CAO modeling protocol (Protocol) submitted to the DEQ on May 30, 2023 in tandem with this report. The remainder of this RAWP outlines the proposed methodology for completing the Level 3 Risk Assessment for the facility and presents specific information required by OAR-340-245-0210(2). In order to avoid duplicating efforts, sections of the Protocol that are relevant to the RAWP are directly referenced where applicable.

# 2 CONCEPTUAL SITE MODEL

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Sections 2 and 3 of the Protocol discuss the facility location, process description, toxic emission units (TEUs), and TAC emission estimates to satisfy the requirements of OAR 340-245-0210(2)(a).

## 2.1 Significant TEUs

Daily and annual TAC emission estimates for the process equipment and emission control devices considered to be TEUs as defined in OAR 340-245-0020(59), are presented in Tables 3-1 through 3-3 of the Protocol. Hydro proposes to assess cancer and noncancer risk using the toxicity weighted emission rate ranking methodology as discussed in Section 3 of the Protocol. Dispersion model IDs and source parameters for significant TEUs are presented in Table 3-6 of the Protocol.

## 2.2 Gas Combustion TEUs

The specific procedures for assessing the risk of each TEU depends on the TEU designation per OAR 340-245-0050(4). Per OAR 340-245-0050(5), the gas combustion “exemption applies to TEUs that solely combust natural gas, propane, [or] liquefied petroleum gas.” Hydro will determine risk from Gas Combustion TEUs at each exposure location separately than risk from Significant TEUs.

Daily and Annual TAC emission rates for gas combustion TEUs are presented in Tables 3-4 and 3-5 of the Protocol, and dispersion model IDs and source parameters are presented in Table 3-6 of the Protocol.

## 2.3 Aggregated TEUs

A Level 3 Risk Assessment will be conducted that includes all facility TEUs other than those qualifying for the gas combustion TEU exemption. After completion of the Level 3 Risk Assessment, if it is determined that one or more of the assessed cancer or noncancer facility risks exceed the source permit RAL, Hydro will decide which, if any, TEUs at the facility may be collectively grouped into the Aggregated TEU category. Aggregated TEU “means all of a source’s TEUs that are identified by an owner or operator with total cumulative risk less than the Aggregate TEU Level” per OAR 340-245-0020(8). For existing sources, the cancer Aggregate TEU RAL is equal to an excess lifetime cancer risk of 2.5-in-one-million, and the noncancer Aggregate TEU RAL is equal to a hazard index of 0.1, as established under OAR 340-245-8010 Table 1.

Cancer and noncancer risks will be reported separately for Gas Combustion, Aggregated TEUs (if any), and Significant TEUs. Risks associated with Aggregated TEUs will be compared with the applicable Aggregated TEU RALs. Only calculated risks associated with Significant TEUs will be compared with the applicable RALs.

# 3 EXPOSURE ASSESSMENT

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## 3.1 Land-Use Zoning Classification—Exposure Types

Section 4 of the Protocol provides details relevant to the exposure assessment, including the dispersion modeling approach to estimate TAC concentrations at exposure locations and the corresponding exposure type classifications to satisfy the requirements under OAR 340-245-0210(2)(b).

## 3.2 Exposure Pathways

Cancer and noncancer risk resulting from facility TEUs are not expected to have additional exposure pathways (i.e., ingestion or injection) other than those already accounted for in each published risk-based concentration (RBC). Moreover, based on a review of land-use zoning classifications and aerial imagery, there are no known locations that might present additional exposure pathways. Since no additional exposure pathways have been observed, the proposed Level 3 Risk Assessment will be sufficient, and a Level 4 Risk Assessment is not warranted.

# 4 RISK CHARACTERIZATION

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## 4.1 Risk-Based Concentrations

Excess cancer risk and chronic and acute noncancer risk will be assessed using the most current RBCs available as shown in OAR 340-245-8010 Table 2. The TACs from the revised CAO emissions inventory and corresponding RBCs to be included in the Level 3 Risk Assessment are presented in Table 4-1 (attached).

## 4.2 Risk Estimates

As described in Section 4.4 of the Protocol, a single dispersion model will be executed using a unit emission rate of 1 gram per second (g/s) for each TEU for both the 24-hour and annual averaging periods. The maximum modeled unit concentration in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) for each averaging period will be considered a “dispersion factor” with units of  $\mu\text{g}/\text{m}^3$  per g/s for each exposure location.

Risk estimates will be determined for each TEU by multiplying this dispersion factor by the TAC-specific emission rate (g/s) presented in the approved CAO emission inventory to produce a maximum predicted model concentration for a given TAC. The risk for a given TAC will be calculated by dividing the maximum predicted model concentration of the TAC by the appropriate RBC. The resulting risk for all TACs will be summed for each TEU. This process is repeated for each TEU. The calculated risk for all TEUs will be summed for each exposure location to obtain the total excess

cancer risk, the total chronic noncancer hazard index, and the total acute noncancer hazard index for the facility. Hydro is not proposing to assess noncancer risk by calculating separate hazard indices per noncancer target organ.

## 4.2.1 Example Calculation—Level 3 Risk Assessment

Example calculations for estimating excess cancer risk and noncancer hazard index (representative of both chronic and acute assessments) for a single proposed exposure location are presented in Equation 1 through Equation 3 per OAR 340-245-0210(2)(c).

### Equation 1.

$$\text{Excess cancer risk (chances-in-a-million)} = \Sigma \frac{(\text{TAC annual emission rate [g/s]} \times (\text{proposed TEU dispersion factor } [\frac{\text{ug/m}^3}{\text{g/s}}]))}{(\text{applicable RBC at exposure location } [\text{ug/m}^3])}$$

### Equation 2.

$$\text{Chronic Noncancer Hazard Index} = \Sigma \frac{(\text{TAC annual emission rate [g/s]} \times (\text{proposed TEU dispersion factor } [\frac{\text{ug/m}^3}{\text{g/s}}]))}{(\text{applicable RBC at exposure location } [\text{ug/m}^3])}$$

### Equation 3.

$$\text{Acute Noncancer Hazard Index} = \Sigma \frac{(\text{TAC daily emission rate [g/s]} \times (\text{proposed TEU dispersion factor } [\frac{\text{ug/m}^3}{\text{g/s}}]))}{(\text{applicable RBC at exposure location } [\text{ug/m}^3])}$$

The total facility excess cancer risk and chronic and acute noncancer hazard index will be derived by summing each individual TAC risk contribution at each proposed exposure location.

## 4.3 Noncancer Risk Action Levels

The Environmental Quality Commission adopted revised CAO hazard index rules on April 24, 2020. The revised hazard index rules identify certain TACs that may have developmental, reproductive, respiratory, or other noncancer severe health effects and set new RALs for these TACs. The noncancer hazard index RALs for existing facilities, both before and after issuance of the new hazard index rules, are presented in Table 4-2. The new hazard index rules do not affect cancer risk determinations.



**Table 4-2. Revisions to the Noncancer Hazard Index Risk Action Levels**

Risk Action Levels For Existing Sources	Noncancer Hazard Index	
	Before Issuance	After Issuance
Aggregate TEU Level	0.1	0.1
Source Permit Level	0.5	0.5
Community Engagement Level	1	1
TBACT Level	5	5 <sup>(a)</sup> or 3 <sup>(b)</sup> or Risk Determination Ratio of >1 <sup>(c)</sup>
Risk Reduction Level	10	10 <sup>(a)</sup> or 6 <sup>(b)</sup> or Risk Determination Ratio of 2 <sup>(c)</sup>
Immediate Curtailment Level	20	20 <sup>(a)</sup> or 12 <sup>(b)</sup> or Risk Determination Ratio of 4 <sup>(c)</sup>

- (a) If all TACs emitted by the source are identified as hazard index of 5 in OAR 340-247-8010, Table 2, and OAR 340-245-8010, Table 2.
- (b) If all TACs emitted by the source are identified as hazard index of 3 in OAR 340-247-8010, Table 2, and OAR 340-245-8010, Table 2.
- (c) If TACs emitted by the source include contaminants listed as both hazard index of 3 and 5 in OAR 340-247-8010, Table 2, and OAR 340-245-8010, Table 2, and a Risk Determination Ratio is required to be calculated under OAR 340-245-0200(5).

The calculation of the risk determination ratio is required when facilities emit a mixture of TACs assigned noncancer TBACT RALs of both a hazard index of 3 and a hazard index of 5, as identified in OAR 340-245-8010, Table 2 and OAR 340-245-8010, Table 2. The risk determination ratio formula under OAR 340-245-0200(5) is summarized below in Equation 4.

**Equation 4.**

$$\text{Risk Determination Ratio} = \frac{\text{Risk}_{\text{HI3}}}{3} + \frac{\text{Risk}_{\text{HI5}}}{5}$$

As shown in the revised CAO emissions inventory, TAC emissions from the facility are comprised of a mixture of TACs with assigned hazard indices of 3 and 5 per OAR 340-247-8010 Table 2 and OAR 340-245-8010 Table 2, respectively. As a result, if the estimated facility chronic and acute noncancer risk is greater than the Community Engagement RAL, the risk determination ratio will be determined per Equation 3.

## 5 UNCERTAINTY ANALYSIS

Although the proposed Level 3 Risk Assessment will be conducted using the most accurate and readily available information, there are various levels of uncertainty associated with the proposed risk assessment. Per OAR 340-245-0210(2)(d), known quantitative and qualitative uncertainties with the proposed Level 3 Risk Assessment include, but may not be limited to, the following:

**Acute Assessments:**

- To assess acute noncancer risk, the full 24-hour exposure duration will be assumed. Acute exposure can occur anywhere from one to 24 hours. Although this risk assessment will assume 24 hours of exposure, it is very unlikely that any individual would be exposed for a full 24 hours outside of a residential location. However, if the toxicity reference value is based on data collected for a lower exposure duration than the 24-hour exposure duration, the estimated

risk may differ. Therefore, for TACs with RBCs that were developed using toxicity reference values based on longer exposure durations, the proposed Level 3 Risk Assessment may overestimate acute noncancer risk due to the 24-hour exposure duration assumption.

- The Level 3 Risk Assessment will be conducted assuming each TEU at the facility is operating at maximum design capacity for 24 hours, simultaneously. For example, the Vertical Paint Line typically does not need to operate at maximum operational capacity, using the coating with the highest toxicity emission rate for a full 24 hours. It is highly unlikely that all TEUs at the facility will simultaneously operate at their maximum capacity for a 24-hour period. Therefore, the proposed Level 3 Risk Assessment likely overestimates acute noncancer risk due to unrealistic operating conditions.
- The proposed Level 3 Risk Assessment includes meteorological conditions which may only occur a few days or less in a one-year period that can result in worst-case dispersion characteristics. It is unlikely that these infrequent meteorological conditions would occur at the same time that the proposed facility will be operating all TEUs at maximum capacity. Therefore, the proposed Level 3 Risk Assessment likely overestimates acute noncancer risk because of the improbability of facility operations at maximum capacity aligning with worst-case meteorological conditions.
- Dispersion modeling will be used to determine the daily dispersion factors per exposure location for use in risk estimate calculations. This method determines, for each TEU, a single day within the five-year period of hourly meteorological data, during which the highest predicted concentration occurs at each exposure location. It is highly unlikely that the maximum predicted concentration at a given exposure location occurs on the same day for all TEUs at the facility. For example, the highest predicted concentration for the Regenerative Thermal Oxidizer may occur at exposure location “X” on March 1 while, due to differences in location, release characteristics (i.e., stack height, velocity, etc.), and meteorological variation, the highest predicted concentration for the Thermally Improved Extrusion Line may occur at exposure location “X” on December 1. The maximum predicted concentrations are not paired-in-time such that maximum predicted concentrations per TEU may occur on different days within the meteorological dataset. Therefore, the proposed Level 3 Risk Assessment likely overestimates acute noncancer risk because it is unlikely that the highest predicted concentration from each TEU occurs at every exposure location on the same day.

### **Cancer and Chronic Noncancer Assessments:**

- The RBCs developed by the DEQ for excess cancer risk and chronic noncancer risk assume a 70-year exposure duration for 24 hours per day. It is unlikely that a person would remain at the same residence or in areas potentially impacted by emissions covered by the CAO program for 70 consecutive years for 24 hours per day. The risk assessments also account for a person being exposed to the local facility emission rate for the entire exposure duration. Therefore, the proposed Level 3 Risk Assessment will overestimate cancer and chronic noncancer risk due to the unrealistic exposure duration assumption.

- The excess cancer and chronic noncancer risk assessments will be performed assuming that all TEUs operate for the course of the calendar year at their maximum operational capacities. It is physically impossible that the facility could operate several of its TEUs at maximum capacity for an entire year without shutdown time for maintenance and cleaning of equipment. Therefore, the proposed Level 3 Risk Assessment will overestimate cancer and chronic noncancer risk due to the overestimation of emissions resulting from continuous maximum capacity facility operation.

**All Assessments:**

- Only excess cancer risk and chronic and acute noncancer hazard index from TACs that have RBCs published by the DEQ will be assessed. Table 5-1 (attached) presents a list of the TACs emitted from the facility TEUs that do not have RBCs published by the DEQ. As a result, the proposed Level 3 Risk Assessment may not accurately assess cancer and/or noncancer risk associated with those TACs that do not yet have an associated RBC. However, the development of RBCs generally has a level of conservatism that will likely overestimate cancer and/or noncancer risk from TACs with known RBCs.

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## 6 CLOSING

MFA looks forward to working with the DEQ through the CAO permit application process. If there are any questions or comments regarding this risk assessment work plan, please contact Leslie Riley at (971) 713-3578.

## LIMITATIONS

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The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

# TABLES



**Table 4-1**  
**Applicable Risk-Based Concentrations**  
**Hydro Extrusion Portland, Inc.—Portland, Oregon**

Toxic Air Contaminant	CAS/DEQ ID	RBC? (Yes/No)	Noncancer TBACT RAL <sup>(1)</sup>	Risk-Based Concentration <sup>(1)</sup> (µg/m <sup>3</sup> )						
				Residential Chronic		Non-Residential Chronic				Acute
				Cancer	Noncancer	Child Cancer	Child Noncancer	Worker Cancer	Worker Noncancer	Noncancer
Antimony and Compounds	7440-36-0	Yes	HI3	--	0.3	--	1.3	--	1.3	1
Arsenic and Compounds	7440-38-2	Yes	HI3	0.000024	0.00017	0.0013	0.0024	0.00062	0.0024	0.2
Barium and Compounds	7440-39-3	No	--	--	--	--	--	--	--	--
Beryllium and Compounds	7440-41-7	Yes	HI3	0.00042	0.007	0.011	0.031	0.005	0.031	0.02
Cadmium and Compounds	7440-43-9	Yes	HI3	0.00056	0.005	0.014	0.037	0.0067	0.037	0.03
Chromium VI, chromate and dichromate particulate	18540-29-9	Yes	HI3	0.000031	0.083	0.00052	0.88	0.001	0.88	0.3
Chromium VI, chromic acid aerosol mist	7738-94-5	Yes	HI3	0.000031	0.0021	0.00052	0.022	0.001	0.022	0.005
Cobalt and Compounds	7440-48-4	Yes	HI3	--	0.1	--	0.44	--	0.44	--
Copper and Compounds	7440-50-8	Yes	HI3	--	--	--	--	--	--	100
Lead and Compounds	7439-92-1	Yes	HI3	--	0.15	--	0.66	--	0.66	0.15
Manganese and Compounds	7439-96-5	Yes	HI3	--	0.09	--	0.4	--	0.4	0.3
Mercury and Compounds	7439-97-6	Yes	HI3	--	0.077	--	0.63	--	0.63	0.6
Nickel and Compounds	7440-02-0	Yes	--	0.0038	0.014	0.1	0.062	0.046	0.062	0.2
Selenium and Compounds	7782-49-2	Yes	HI3	--	--	--	--	--	--	2
Vanadium (fume or dust)	7440-62-2	Yes	HI3	--	0.1	--	0.44	--	0.44	0.8
Zinc and Compounds	7440-66-6	No	--	--	--	--	--	--	--	--
Ethene, 1,1-difluoro-, homopolymer	489	No	--	--	--	--	--	--	--	--
Acetaldehyde	75-07-0	Yes	HI3	0.45	140	12	620	5.5	620	470
Acrolein	107-02-8	Yes	HI5	--	0.35	--	1.5	--	1.5	6.9
Ammonia	7664-41-7	Yes	HI3	--	500	--	2,200	--	2,200	1,200
Benzene	71-43-2	Yes	HI3	0.13	3	3.3	13	1.5	13	29
Ethylbenzene	100-41-4	Yes	HI3	0.4	260	10	1,100	4.8	1,100	22,000
Formaldehyde	50-00-0	Yes	HI3	0.17	9	4.3	40	2	40	49
Hexane	110-54-3	Yes	HI3	--	700	--	3,100	--	3,100	--
Isopropyl alcohol	67-63-0	Yes	HI3	--	200	--	880	--	880	3,200

**Table 4-1**  
**Applicable Risk-Based Concentrations**  
**Hydro Extrusion Portland, Inc.—Portland, Oregon**

Toxic Air Contaminant	CAS/DEQ ID	RBC? (Yes/No)	Noncancer TBACT RAL <sup>(1)</sup>	Risk-Based Concentration <sup>(1)</sup> (µg/m <sup>3</sup> )						
				Residential Chronic		Non-Residential Chronic				Acute
				Cancer	Noncancer	Child Cancer	Child Noncancer	Worker Cancer	Worker Noncancer	Noncancer
n-Butyl alcohol	71-36-3	No	--	--	--	--	--	--	--	--
Toluene	108-88-3	Yes	HI3	--	5,000	--	22,000	--	22,000	7,500
Xylene (m-xylene, o-xylene, p-xylene)	1330-20-7	Yes	HI3	--	220	--	970	--	970	8,700
Propylene glycol monomethyl ether acetate	108-65-6	No	--	--	--	--	--	--	--	--
Cumene	98-82-8	Yes	HI3	--	400	--	1,800	--	1,800	--
Dimethyl phthalate	131-11-3	No	--	--	--	--	--	--	--	--
1,2,3-Trimethylbenzene	526-73-8	Yes	HI3	--	60	--	260	--	260	--
1,2,4-Trimethylbenzene	95-63-6	Yes	HI3	--	60	--	260	--	260	--
2-Butanone (Methyl ethyl ketone)	78-93-3	Yes	HI3	--	5,000	--	22,000	--	22,000	5,000
Ethylene glycol monobutyl ether	111-76-2	Yes	HI3	--	82	--	360	--	360	29,000
Hydrogen Fluoride	7664-39-3	Yes	HI3	--	2.1	--	19	--	19	16
Methylene Diphenyl Diisocyanate (MDI)	101-68-8	Yes	HI3	--	0.08	--	0.35	--	0.35	12
Diethylene glycol monobutyl ether	112-34-5	Yes	HI3	--	0.1	--	0.44	--	0.44	--
Polycyclic Aromatic Hydrocarbons (PAH)	401	Yes	--	0.000043	--	0.0016	--	0.003	--	--
Benzo(a)pyrene	50-32-8	Yes	HI3	0.000043	0.002	0.0016	0.0088	0.003	0.0088	0.002
Naphthalene	91-20-3	Yes	HI3	0.029	3.7	0.76	16	0.35	16	200
Molybdenum trioxide	1313-27-5	No	--	--	--	--	--	--	--	--

REFERENCE:

(1) See Oregon Administrative Rule 340-245-8010 Table 2.

**Table 5-1**  
**List of TACs With No Published Risk-Based Concentrations**  
**Hydro Extrusion Portland, Inc.—Portland, Oregon**

Toxic Air Contaminant	CAS/DEQ ID	Risk-Based Concentration? <sup>(1)</sup> (Yes/No)
Barium and compounds	7440-39-3	No
Zinc and Compounds	7440-66-6	No
Ethene, 1,1-difluoro-, homopolymer	489	No
n-Butyl alcohol	71-36-3	No
Propylene glycol monomethyl ether acetate	108-65-6	No
Dimethyl phthalate	131-11-3	No
Molybdenum trioxide	1313-27-5	No

REFERENCES:

(1) Oregon Administrative Rule 340-245-8010 Table 2.