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Cleaner Air Oregon Level-1 Modeling Protocol  
And Risk Assessment

Arcimoto Project

Prepared for:  
Lane Regional Air Protection Agency

November 5, 2021  
Revised April 25, 2022

BRIDGEWATER GROUP, INC.

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- A Air Toxics Reporting Form AQ520 (electronic submission)
- B Level 1 Risk Assessment Calculation Tools (electronic submission)

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# 1.0 Introduction

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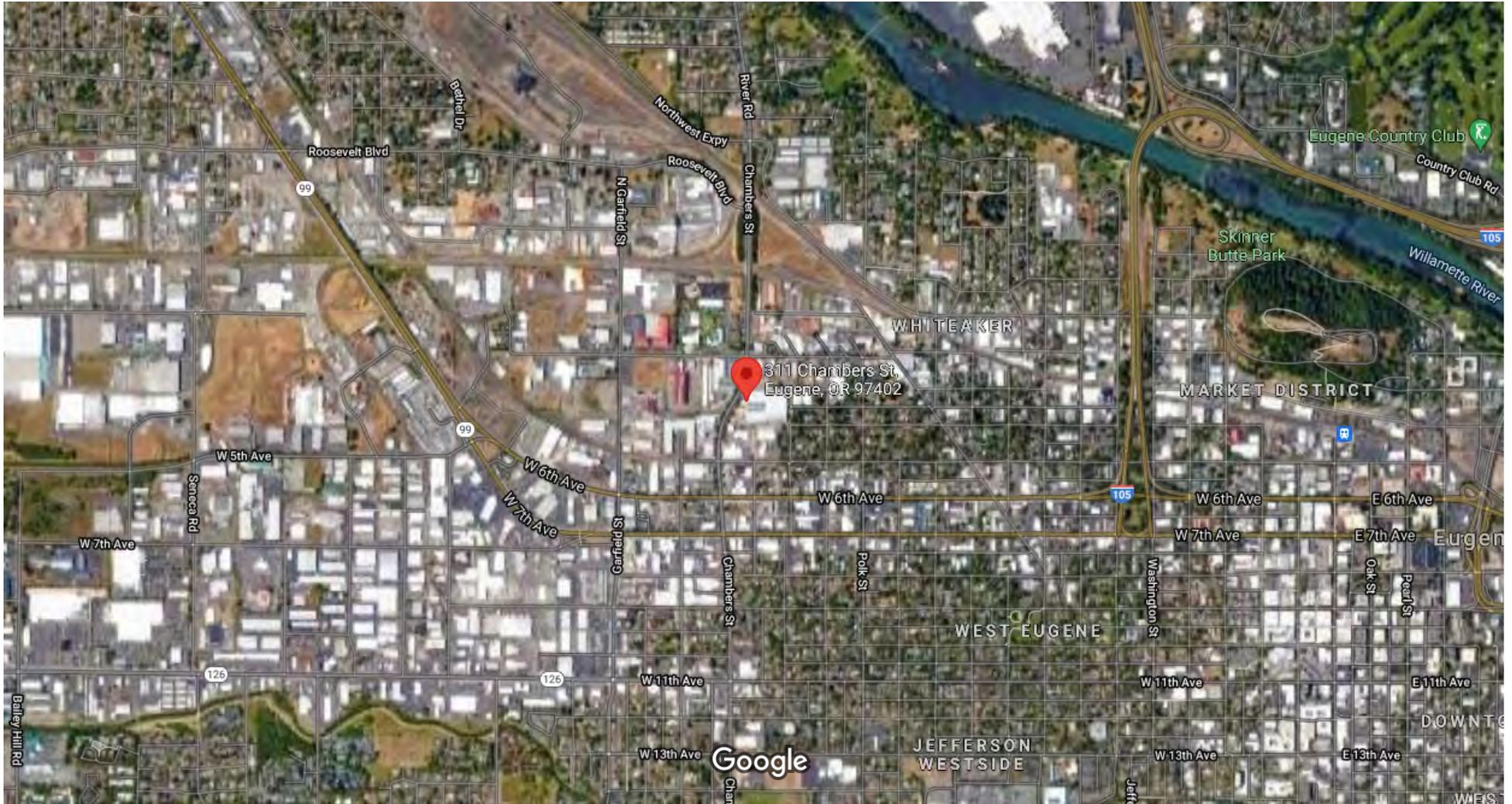
Arcimoto is proposing to build a manufacturing facility for ultra-efficient electric vehicles. The facility will be located at 311 Chambers Street in Eugene, Oregon 97402. A site location map is provided in Figure 1-1 and a site plan is provided in Figure 1-2.

The manufacturing process involves the machining, coating and assembly of parts. Additional information about the project may also be found in the accompanying Simple ACDP application.

Under the new CAO regulations, facilities must submit a modeling protocol and emissions inventory prior to submitting the CAO risk assessment unless they are proposing to conduct a Level-1 risk assessment. Arcimoto performed a Level-1 risk assessment for this project and this document includes a modeling protocol and the risk assessment.

As described within this document the evaluation of the facility's health risk under the Cleaner Air Oregon (CAO) program [OAR 340-245-0050] demonstrates that the facility risk levels are above the Source Permit Levels but below Community Engagement Levels for New Sources identified in OAR 340-245-8010 Table 1.

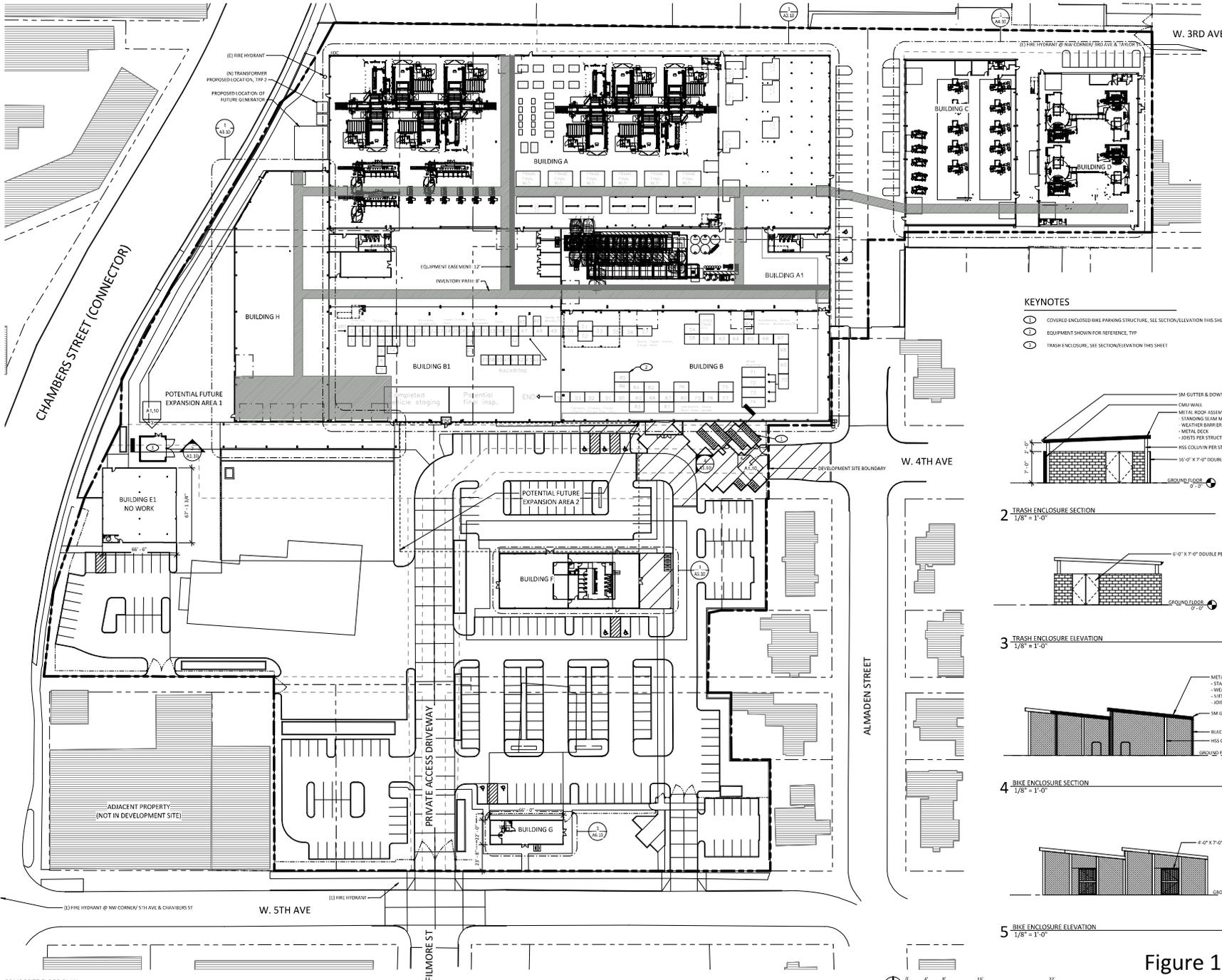
Arcimoto Project Address: 311 Chambers St



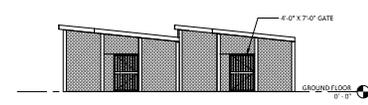
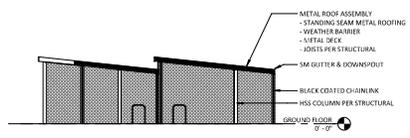
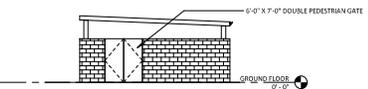
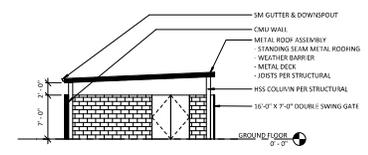
Imagery ©2021 Landsat / Copernicus, Maxar Technologies, State of Oregon, Map data ©2021 1000 ft

Figure 1-1  
Site Location

NOT FOR CONSTRUCTION



- KEYNOTES**
- ⊙ COVERED ENCLOSED BIKE PARKING STRUCTURE, SEE SECTION/ELEVATION THIS SHEET
  - ⊙ EQUIPMENT SHOWN FOR REFERENCE, TYP
  - ⊙ TRASH ENCLOSURE, SEE SECTION/ELEVATION THIS SHEET



1 - COMPOSITE FLOOR PLAN  
 1/32" = 1'-0"

Figure 1-2  
 Site Plan

ARCIMOTO RAMP  
 3111 CHAMBERS ST, EUGENE, OR, 97402  
 SCHEMATIC DESIGN  
 JOB NO: 23138  
 ISSUE DATE: 30 APRIL 22  
 COMPOSITE FLOOR PLAN

A1.10  
 SD SET

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# 2.0 Source Description

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## 2.1 Process Overview

The Arcimoto project to manufacturer ultra-efficient electric vehicles primarily will take place inside four existing buildings (Buildings A, B, C and F) in Eugene, Oregon. As shown in the process flow diagrams in the accompanying Simple ACDP application, the production processes can be divided into fabrication, thermoforming, welding, laser cutting, coating line, coating oven and assembly. Emissions of Toxic Air Contaminants (TACs) will include natural gas combustion pollutants, electrocoating and curing emissions, metal cleaning and pretreatment chemicals, welding fume and laser cutting metal particulate. Thermoforming of ABS (acrylonitrile butadiene styrene) will take place at the facility. Chemicals are not planned to be used in the thermoforming process. Processing temperatures will be approximately 160-180 °C and the plastic will remain stable, i.e., under normal conditions temperatures will not be high enough to produce air emissions from breakdown products of the individual monomers acrylonitrile, butadiene, or styrene.

## 2.2 Source Descriptions

The CAO program defines emissions producing activities that may emit toxic air contaminants listed in OAR 340-245-8020 Table 2 as toxic emission units or TEUs. A CAO risk assessment must include all TEUs at a facility except for the following:

- Exempt TEUs;
- Gas combustion TEUs
- Aggregated TEUs

Exempt TEUs at the proposed Arcimoto facility include the four small natural gas-fired heating equipment identified in the ACDP application as Categorically Insignificant Activities (CIA) and listed Table 2-1. These units are identified in the emissions inventory (Form AQ520) but calculation of emission rates and risk are not included.

**Table 2-1: CIA Exempt TEUs**

Source	ID	Description
Back-up Condensing Boiler in Bldg. C	B1	Natural gas-fired boiler- 1.6 MM Btu/hr
Bldg. F Domestic Hot Water Heaters	B2	2 Natural gas-fired hot water heaters- each at 0.16 MM Btu/hr
Pretreatment Heater Stage 1	H1	Natural gas-fired heater on Stage 1 of the coating line- 0.9 MM Btu/hr
Infrared Radiant Heating Units	H4	27 Natural gas-fired heaters spread throughout the facility- each at 0.2 MM Btu/hr

Gas combustion TEUs at the proposed Arcimoto facility include the Pretreatment Heater Stage 2 (H2) and the Coating Oven-Burner (H3). These two units are included in the emission inventory, emission calculations are provided and risk is calculated but not added to the overall

facility risk assessment result.

The TEUs at the proposed facility include both fugitive and point source emission points. The emission point locations are shown in Figure 2-1. Table 2-1 shows the source characterization that will be used for the Level-1 Assessment:

**Table 2-2: Source Characterization**

Source	Emission Point ID	Height	UTM X (m)	UTM Y (m)	Description
<b>Gas Combustion TEUs Information</b>					
Pretreatment Heater Stage 2- H2	EX3 Point	13 m	490678.8	4878093.2	Natural gas-fired burner on Stage 2 of the coating line- 0.9 MM Btu/hr
Coating Oven- Burner- H3	EX4 Point	13 m	490691.9	4878083.7	Natural gas-fired burner for oven- 4.0 MM Btu/hr
<b>Other TEUs Information</b>					
Coating Oven- CO1- front end	EX5 Point	13 m	490708.0	4878084.7	Bake oven used to cure coating
Coating Oven- CO1- back end	EX6 Point	13 m	490672.3	4878082.1	Bake oven used to cure coating
Coating Line- CL1	EX1 Point	13 m	490693.1	4878093.2	Series of dip tanks including pretreatment cleaning baths and ecoating dip tank prior to coating oven
Welding- W1	W1-Bldg A 97,000 sf Fugitive	Bldg A 33 ft	490692.605	4878152.32	Welding stations vented to a cartridge filter into a building
Laser Cutting- L1	W1-Bldg A 97,000 sf Fugitive	Bldg A 33 ft	490692.605	4878152.32	Laser cutting stations vented to a cartridge filter into a building

## 2.3 TACs Potentially Emitted

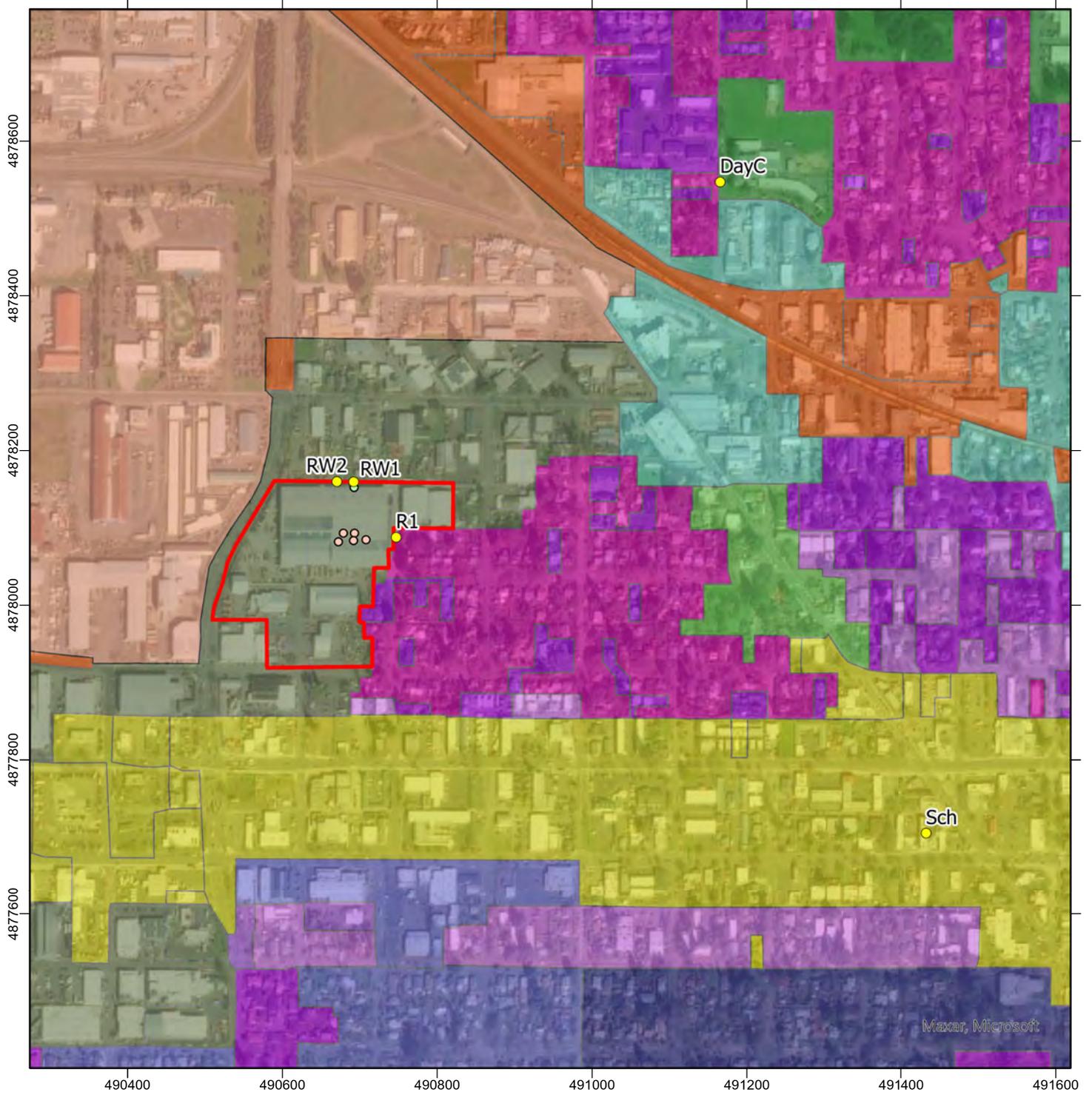
TAC emission estimates for the emission sources at the facility are provided in LRAPA Form AQ520 in Appendix A and in the Level 1 Risk Assessment Tool provided in Appendix B. Details regarding the emission calculation methodology and assumptions used to estimate TAC emissions is provided in the accompanying ACDP application and subsequent submissions to LRAPA in response to requests for supplemental information.

## 2.4 Exposure Locations

Figure 2-2 shows the land use around the Arcimoto facility. The land use was derived from the 2017 Oregon Zoning data layer provided by the Oregon Department of Land Conservation and Development. This data layer is an element of the Oregon GIS Framework and is available through the Oregon Spatial Data Library<sup>1</sup>. The feature class contains zoning data from 198 local jurisdictions, including the City of Eugene and Lane County. The data set has 55 zoning classifications, which are binned into three categories: residential, industrial/commercial, and open space. The open space category includes parks, forests, beaches, public lands, and agricultural areas. The residential bin includes any category designating a residence. For example, mixed use commercial and residential areas and tribal reservation lands are defined as residential. Residences located in farm land or forested area were manually identified based



**Figure 2-1  
Emission Point Locations**



### Legend

- ▭ Property Line
- Exposure Location

### Sources

- Type
- F
  - S

### Eugene Zoning

#### Code\_name

- ▭ C-1 Neighborhood Commercial
- ▭ C-2 Community Commercial
- ▭ E-2 Mixed Use Employment
- ▭ GO General Office
- ▭ I-2 Light-Medium Industrial
- ▭ I-3 Heavy Industrial

- ▭ PL Public Land
- ▭ R-1 Low-Density Residential
- ▭ R-2 Medium-Density Residential
- ▭ R-3 Limited High-Density Residential
- ▭ S-C Chambers Special Area
- ▭ S-HB Blair Boulevard Historic Commercial Special Area
- ▭ S-JW Jefferson Westside Special Area
- ▭ S-W Whiteaker Special Area

**Figure 2-2**  
**Exposure Locations and Land Use**

on aerial imagery.

The zoning dataset does not identify schools or daycares. The closest school and daycare were manually identified using an internet search (e.g., using a search engine and Google Earth).

<sup>1</sup> <https://spatialdata.oregonexplorer.info/geoportal/>

The Arcimoto facility is located in an area surrounded by “Mixed-Use Employment” & Low-Density Residential” zoning designations. The “Mixed-Use Employment” zone allows for residential development therefore the facility was considered to be surrounded by residential and worker receptors for the purpose of the Level 1 assessment. The location of the facility exhaust points and the proposed exposure locations along with the land use around the site are shown in Figure 2-2. The distances (in meters) from each Toxic Emission Unit (TEU) to the exposure location is shown in Table 2-3. For the risk evaluation, the closest distance for each TEU and receptor type will be used and these distances are highlighted in yellow in Table 2-3.

The Coating Oven (CO1) source has two exhaust stacks (EX5 and EX6) for coating curing emissions. For the Level-1 risk analysis, it was assumed that all of the coating curing emissions from the Coating Oven were emitted from the stack closest to the exposure locations (EX5).

**Table 2-3: Distances from each TEU to the Exposure Locations**

			Distance from TEU to Receptor (m)						
			Residential R1	Residential RW1	Residential RW2	Worker RW1	Worker RW2	Daycare DayC	School Sch
	Recp ID								
	UTM X		490747.0	490670.4	490692.1	490670.36	490692.1	491165.5	491432.7
TEU	UTM Y		4878087.9	4878159.9	4878159.7	4878159.9	4878160	4878547.3	4877705
ID	UTM X	UTM Y							
EX1	490693.1	4878093.2	54.1	70.5	66.5	70.5	66.5	655.2	835.1
EX3	490678.8	4878093.2	68.4	67.2	67.7	67.2	67.7	665.6	847.8
EX4	490691.9	4878083.7	55.2	79.2	75.9	79.2	75.9	662.7	831.8
EX5	490708.0	4878084.7	39.1	84.0	76.6	84.0	76.6	650.6	818.0
EX6	490672.3	4878082.1	74.9	77.9	80.1	77.9	80.1	677.9	848.6
W1	490692.6	4878152.3	84.3	23.5	7.3	23.5	7.3	616.1	864.6
L1	490692.6	4878152.3	84.3	23.5	7.3	23.5	7.3	616.1	864.6

## 2.5 Evaluation Methodology

A Level 1 Risk Assessment includes using the Level 1 Risk Assessment Tool in OAR 340-245-8050 Table 5 to determine toxic air contaminant concentrations at approved exposure locations.

For the TEU stack source, the stack height and closest exposure distance from Table 2-2 and Table 2-3 will be used to identify the appropriate annual and 24-hour dispersion factors under OAR 340-245-8050 Table 5A and 5B. The TEU risk will be calculated for each pollutant by

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multiplying the appropriate dispersion factor by the pollutant emission rate then dividing by the appropriate Risk Based Concentration (RBCs) from OAR 340-245-8050 Table 3. Residential RBC will be applied at the residential exposure locations, child RBC's at the school and daycare locations, and worker RBC's at the Industrial/Commercial locations. The acute exposure will be evaluated at the closest overall distance, regardless of type.

For each TEU, the pollutant risks will be summed. Since there are seven types of RBCs, seven risk values will be determined for each TEU. The excess chronic cancer risk will be the maximum of the residential chronic cancer risk, the child chronic cancer risk or the worker chronic cancer risk. The chronic hazard risk will be the maximum of the residential chronic non-cancer risk, the child chronic non-cancer risk or the worker chronic non-cancer risk. Then the total risk will be calculated as the summation of individual TEU risks and compared to the new facility Risk Action Levels shown in Table 2-4. The risk from TEUs which only combust natural gas will be included in the facility wide risk summation. All of these calculations will be performed using a macro-based Excel® spreadsheet as provide in Appendix B

**Table 2-4: New Source Risk Action Levels**

<b>Level Description</b>	<b>Cancer</b>	<b>Non-Cancer</b>
Source Permit Level	0.5	0.5
Community Engagement Level	5	1
TLAER Level	10	1
Permit Denial Level	25	1

# 3.0 Risk Assessment

## 3.1 Summary

The results of the Level 1 risk assessment are summarized in Tables 3-1 and 3-2 below. The Level 1 risk assessment information and calculations including emission rates, discharge heights, dispersion factors, exposure distances, RBCs and summed risk values for each exposure type is provided as Excel spreadsheets in Appendix B.

The natural gas combustion TEUs are required to report their risk (Table 3-2) but are not required to be compared to Risk Action Levels [OAR340-245-0050(5)]. The facility calculated risk levels are below the Source Permit Levels identified in OAR 340-245-8010 Table 1 and the source is considered a de minimis source.

**Table 3-1: Level 1 Risk Assessment Summary for TEUs**

Exposure	Risk**	Rounded Risk***	Community Engagement Risk Action Level
Cancer Risk (CR)			
Residential	0.5023	1	>5
Non-Res Worker	0.0158	0	
Non-Res Child	0.0008	0	
Chronic Non-Cancer Risk (CHI)			
Residential	0.8908	1	>1
Non-Res Worker	0.1910	0	
Non-Res Child	0.0060	0	
Acute Risk (AHI)	0.5759	0	>1

\*\*“Risk” refers to Excess Cancer Risk and Noncancer Hazard Index (OAR 340-245-0020)

\*\*\*For comparison to a Risk Action Level final risk calculation is rounded off to a whole number. (340-245-0200 4(a)(B))

**Table 3-2: Level 1 Risk Assessment Summary for Natural Gas Combustion Units**

Exposure	Risk**	Rounded Risk***
Cancer Risk (CR)*		
Residential	0.5103	0.5
Non-Res Worker	0.0180	0.0
Non-Res Child	0.00051	0.0
Chronic Non-Cancer Risk (CHI)		
Residential	0.0609	0.1
Non-Res Worker	0.0049	0.0
Non-Res Child	0.00025	0.0
Acute Risk (AHI)	0.017	0.0

\*\*“Risk” refers to Excess Cancer Risk and Noncancer Hazard Index (OAR 340-245-0020)

\*\*\*For comparison to the Source Permit Level this final risk calculation is rounded off to one decimal place. (340-245-0200 4(a)(A))