

# COMBINED MODELING PROTOCOL AND RISK ASSESSMENT WORK PLAN

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PACKAGING CORPORATION OF AMERICA  
SALEM, OREGON



*Prepared for*  
**OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY**  
CLEANER AIR OREGON PERMITTING PROGRAM  
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## ACRONYMS AND ABBREVIATIONS

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ACDP	Air Contaminant Discharge Permit
ASOS	automated surface observation system
CAO	Cleaner Air Oregon
DEQ	Oregon Department of Environmental Quality
USEPA	U.S. Environmental Protection Agency
facility	corrugated sheet stock and container manufacturing facility at 2121 Madrona Avenue SE in Salem, Oregon
g/s	grams per second
MFA	Maul Foster & Alongi, Inc.
NCEI	National Center for Environmental Information
NLCD16	State of Oregon National Land Cover Dataset, 2016
OAR	Oregon Administrative Rule
PCA	Packaging Corporation of America
RAL	Risk Action Level
RAWP	Risk Assessment Work Plan
RBC	risk-based concentration
Salem McNary station	Salem McNary Regional Airport monitoring station (Station ID 24232) in Salem, Oregon
TAC	toxic air contaminant
TEU	toxic emission unit
ug/m <sup>3</sup>	micrograms per cubic meter
USGS	United States Geological Survey

# 1 INTRODUCTION

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Packaging Corporation of America (PCA) owns and operates a corrugated sheet stock and container manufacturing facility located at 2121 Madrona Avenue SE in Salem, Oregon 97302 (the “facility”). The facility operates under Simple Air Contaminant Discharge Permit (ACDP) No. 24-8061-ST-01 issued by the Oregon Department of Environmental Quality (DEQ) on February 10, 2021.

Maul Foster & Alongi, Inc. (MFA) has been retained by PCA to assist the facility with the dispersion modeling and risk assessment components of the Cleaner Air Oregon (CAO) permitting program. On November 25, 2020, PCA submitted an emissions inventory containing annual and daily toxic air contaminant (TAC) emission estimates to the DEQ for review and approval in compliance with the initial step of the CAO permit application process as specified in Oregon Administrative Rule (OAR) 340-245-0040(3). The DEQ completed internal review and approved the submitted TAC emissions inventory by letter dated February 17, 2021.

As stated in OAR 340-245-0030(2)(b), a modeling protocol must be submitted no later than 30 days after receiving DEQ approval of the CAO emission inventory. PCA 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 index) impacts from the facility for comparison to the applicable risk action levels shown in OAR 340-245-8010 Table 1. In addition, 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, in accordance with OAR 340-245-0030(2)(c). PCA is electing to combine the modeling protocol and RAWP into a single submittal. The remainder of this combined modeling protocol and RAWP outlines the proposed methodology for modeling and completing the Level 3 Risk Assessment for the facility. Specific information required by OAR 340-245-0210(1) and (2) are also presented where applicable. This revision reflects PCA’s response to comments supplied by the DEQ.

## 2 FACILITY DESCRIPTION

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### 2.1 Facility Location

The facility is located in Salem, Oregon, within the Salem urban growth boundary. An aerial image of the facility location and the property boundary is shown in Figure 2-1. The northeastern property boundary is adjacent to the Union Pacific Railroad line.

The area immediately surrounding the facility is characterized primarily by flat terrain with a mixture of land-use zoning including residential, mixed-use, and industrial. Existing land-use zoning information for the area surrounding the facility is discussed in more detail in Section 5.2. The topography of the area immediately surrounding the proposed facility is presented in Figure 2-2.

## 2.2 Process Description

The facility manufactures corrugated sheet stock and corrugated containers from paper roll stock. The stock is processed in the corrugator, where the sheet stock is fluted and a mixture of starch, water and other additives is applied by roller. The fluted sheet stock is then sandwiched between two layers of sheet stock and indirectly heated with steam to produce corrugated sheet stock. Steam is supplied to the corrugator by two natural gas-fired boilers.

To meet customer specifications, corrugated sheet stock may be converted into containers. The conversion process involves cutting, printing, gluing and folding the sheet to meet the final container size and shape for end use.

# 3 EMISSION ESTIMATES AND MODEL SOURCES

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Annual and daily TAC emission estimates for the process equipment and activities considered to be toxics emissions units (TEUs), as defined in OAR 340-245-0020(61), were prepared by PCA, as shown in the DEQ-approved emissions inventory. The DEQ-approved annual and daily TAC emission estimates will be converted to units of grams per second (g/s) for purposes of conducting the Level 3 Risk Assessment as shown in Table 3-1 and Table 3-2 (attached), respectively. Table 3-3 and Table 3-4 (attached) present the annual and daily TAC emission estimates, respectively, for only those TACs with established risk-based concentrations (RBCs) set forth under OAR 340-245-8040 Table 4.

The TEUs identified in the DEQ-approved emissions inventory will be represented in a dispersion model developed to represent the facility. Each TEU included in the dispersion model will be modeled using a unit emission rate equivalent to 1 g/s for all modeled source types as shown in Table 3-5 (attached). Additional details describing unit emission rate modeling are provided in Section 4.4, and specific procedures for assessing the impact of each TEU are provided in Section 5.

## 3.1 TEU—Boilers

The facility operates two natural gas-fired boilers, each with a rated maximum heat input capacity of 14.7 million British thermal units per hour. Exhaust from each boiler is emitted to atmosphere through a dedicated stack. Each boiler stack will be represented in the dispersion model as an individual point source with a unique label (BLR\_1 and BLR\_2). The proposed release parameters for the boiler stacks are presented in Table 3-5 (attached).

## 3.2 TEU—Ink

The facility applies water-based inks to corrugated containers via flexographic printers to meet customer product specifications. Certain inks used by the facility contain compounds considered to be TACs. As a result, fugitive emissions of volatile TACs may occur during application and use of

water-based inks. Ink use occurs at various locations within the production building and fugitive TAC emissions are released to atmosphere via the building ventilation system.

The facility has nine powered roof vents for building ventilation. Each roof vent will be represented as an individual point source in the dispersion model with a unique label (VENT\_1 through VENT\_9). One roof vent has been decommissioned. The vent fan and motor are disabled and there is a cover and panels over the vent that are maintained in a closed and sealed position. Therefore, this vent is not included as a release point in the dispersion model.

The proposed release parameters for the building vents are shown in Table 3-5 (attached). The building vent descriptions in Table 3-5 (attached) refer to the general vicinity of processes within the building. The building vents are part of the building ventilation system and are not designed or dedicated to any specific processes or process areas. The building vents pull fresh air inside the plant, creating mixing and movement throughout the building airspace and providing fresh air and cooling inside the plant. The ventilation system is designed to maintain a slightly negative pressure in the building and the roof vents are the only release point for building ventilation air.

Although there are walls in the interior of the main building (where ink and glue use occurs), none of the walls extend for the entire length of the building, and not all of the walls extend from floor to ceiling. As a result, there are no areas within the main building that are isolated from other sections and ventilation air can move freely among different areas.

Based on the facility process layout, the building layout, and the design of the building ventilation system, fugitive TAC emissions from ink application and use are assumed to be well-mixed with the general building air (and fugitive emissions from glues), and equally distributed among each powered vent which emits to atmosphere.

### 3.3 TEU—Glue

Multiple glues are applied to corrugated sheets to form containers depending on customer specifications. Certain glues used by the facility contain compounds considered to be TACs. As a result, fugitive emissions of volatile TACs may occur during glue application.

Glue application occurs at various locations within the production building. TAC emissions are emitted to atmosphere through the building ventilation system. Similar to inks and as described in Section 3.2, fugitive TAC emissions from glue application are assumed to be well-mixed with building air (and fugitive emissions from inks), and equally distributed among each powered roof vent (VENT\_1 through VENT\_9) which emits to atmosphere.

## 4 AIR DISPERSION MODELING METHODOLOGY

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The following subsections detail the proposed air dispersion model input parameters for the facility.

## 4.1 Model Selection

MFA proposes to set up the dispersion model of the facility using the model versions shown in Table 4-1. Lakes Environmental, a third-party overlay software, will be used to execute the dispersion modeling assessments.

**Table 4-1. Proposed Model Selection**

Model	Model Version
AERMOD	19191
AERMET	19191
AERMAP	18081
AERSURFACE	20060
AERMINUTE	15272
BPIP-PRM	04274

## 4.2 Meteorological Data

MFA proposes to use the meteorological and terrain data files shown in Table 4-2.

**Table 4-2. Proposed Meteorological and Terrain Data**

Dataset	Station ID
Surface	Station ID 24232 for Salem, OR (National Center for Environmental Information)
Upper Air	Station ID 24232 for Salem, OR (National Oceanic and Atmospheric Administration/ Earth System Research Laboratory Radiosonde Database)
Terrain	United States Geologic Survey National Elevation Dataset (1/3-arc seconds with horizontal resolution of 10 meter)

### 4.2.1 Surface Data

Surface meteorological data were collected from the Salem McNary Regional Airport monitoring station (ID 24232) located in Salem, Oregon (Salem McNary station). Hourly data for wind speed, wind direction, cloud cover, and temperature for the period between January 1, 2016 through December 31, 2020 were downloaded by file transfer protocol from the National Center for Environmental Information (NCEI). Salem McNary station data were determined to be the most representative publicly available surface meteorological data for the facility because it is the closest meteorological station to the facility location with data available for download from the NCEI, (approximately 1.3 kilometers to the southeast of the facility), and both the Salem McNary station and the facility are centrally located within the Willamette Valley.

The Salem McNary station is part of the National Weather Service Automated Surface Observation Systems (ASOS) network. The station collects wind speed and wind direction, both of which are



sampled once per second, with the average computed every five seconds. These data are referred to as “ASOS 1-minute.”

The Salem McNary station is part of the Ice-Free Winds Group (IFW) within the ASOS network. IFW stations collect wind data, using a sonic anemometer, which has no minimum detection threshold to determine “calms.” The ASOS 1-minute data (TD-6405) for the years 2016 through 2020 were extracted by file transfer protocol from the NCEI. These data were processed using the EPA AERMINUTE program.

## 4.2.2 Upper Air Data

Upper air meteorological data were extracted from the National Oceanic and Atmospheric Administration Earth System Research Laboratory Radiosonde Database for the years 2016 through 2020 using the Forecast Systems Laboratory format for Salem McNary station.

## 4.2.3 Data Processing—AERMET

The meteorological data were processed using the U.S. Environmental Protection Agency (EPA) AERMET program to produce five years of model-ready meteorological data for use in the AERMOD model. The adjustment to the surface frictional velocity option (i.e., ADJ\_U\*) was selected as part of the AERMET processing. The land-use surface characteristics were processed using AERSURFACE.

AERMET allows for a default wind speed adjustment selection option when ASOS 1-minute data are used. This option adds 0.26 meters per second to all wind speeds to account for wind speed truncation (in units of whole knots) applied by the ASOS quality assurance system. Per the EPA technical memorandum titled “Use of ASOS meteorological data in AERMOD dispersion modeling”<sup>1</sup> dated March 8, 2013, a minimum wind speed detection threshold of 0.5 meters per second was used to account for the adjustment. Wind direction randomization was not selected in AERMET because ASOS 1-minute data increase the precision of wind direction measurements and, unlike non-ASOS data, are rounded to the nearest ten whole degrees.

MFA performed an analysis of the missing hours in the five-year meteorological dataset using the QA feature available in the Lakes Environmental software. Each calendar quarter in the meteorological dataset must have fewer than 10% missing hours to be considered valid and complete. As shown in Table 4-3 (attached), each quarter met this criterion.

A wind rose for the five-year meteorological dataset is presented in Figure 4-1. As shown in Figure 4-1, the wind rose indicates a bimodal wind distribution blowing from the south and north. This is consistent with the orientation of the Willamette Valley relative to the position of the facility.

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<sup>1</sup> [https://www3.epa.gov/ttn/scram/guidance/clarification/20130308\\_Met\\_Data\\_Clarification.pdf](https://www3.epa.gov/ttn/scram/guidance/clarification/20130308_Met_Data_Clarification.pdf)

## 4.3 Land Use

MFA utilized the EPA AERSURFACE land-use tool to generate seasonal values for albedo, Bowen ratio, and surface roughness heights. State of Oregon National Land Cover Dataset, 2016 (NLCD16) land cover class definitions, along with concurrent percent impervious surface and percent tree canopy data, were downloaded from the United States Geological Survey (USGS) and processed using AERSURFACE to generate the surface characteristics necessary to run AERMET. The NLCD16 data were processed in AERSURFACE using the settings described in Table 4-4 (attached).

Soil moisture conditions were determined following the methodology set forth in Section 3.2.8 of the EPA AERSURFACE User's Guide dated February 2020. As detailed in Section 3.2.8, “[*surface moisture*] should be entered as either WET, DRY or AVERAGE, where, in general, WET is defined as precipitation amounts equal to or greater than the 70<sup>th</sup> percentile of the 30-year climatological records; DRY is equal to or less than the 30<sup>th</sup> percentile; and AVERAGE is between the 30<sup>th</sup> and 70<sup>th</sup> percentiles.”

Annual precipitation data for the Salem McNary station were retrieved from the Western Regional Climate Center<sup>2</sup> for the years 2016 to 2020. Annual precipitation data for each year of the 5-year meteorological dataset were reviewed and compared against the 30-year climatological record to determine the representative surface moisture condition for each modeling year. As shown in Table 4-5 (attached), the average annual precipitation for each year of the 5-year meteorological dataset varied between the lower 30<sup>th</sup> percentile to greater than the 70<sup>th</sup> percentile of the 30-year climatological record. To account for this variability, MFA executed the AERSURFACE program using the corresponding surface moisture condition associated with each calendar year's annual rainfall.

MFA proposes to execute the dispersion model using rural dispersion coefficients. To make this determination, MFA followed the land use procedure, as recommended by Appendix W of Title 40 Code of Federal Regulations Part 51<sup>3</sup>, to conclude that less than 50 percent of the land use within the modeling domain is represented by the urban land use type.

## 4.4 Unit Emission Rate

Each TEU included in the dispersion model will be modeled using a unit emission rate equivalent to 1 g/s for all modeled source types to predict “dispersion factors” for each TEU in micrograms per cubic meter (ug/m<sup>3</sup>) per g/s. Dispersion factors from the unit emission rate model for each TEU will be used to derive the predicted concentrations for multiple TACs from a given TEU. Multiplying the dispersion factor by the TAC emission rate for the modeled TEU results in the modeled concentration of the TAC. MFA proposes to execute the dispersion model using unit emission rates for all TEUs, for both the annual and daily (i.e., 24-hour) averaging periods.

The dispersion factors will be used to conduct the proposed Level 3 Risk Assessment, in combination with TAC emission rates for each TEU in g/s and the RBCs in ug/m<sup>3</sup> set forth under OAR 340-245-8040 Table 4.

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<sup>2</sup> <https://wrcc.dri.edu/> [Accessed on February 8, 2021]

<sup>3</sup> Appendix W to Part 51—“Guideline on Air Quality Models.” See Section 7.2.1.1.

## 4.5 Emissions Unit Locations

The location of each TEU to be included in the dispersion model is shown in Figure 4-2.

## 4.6 Building Downwash

The current version of the EPA Building Profile Input Program, incorporating the Plume Rise Model Enhancements Algorithms (e.g. BPIP-PRM) will be used as shown in Table 4-1 to derive direction-specific downwash parameters for significant building structures located at the facility. The locations for structures that are projected to influence downwash are included in Figure 4-2. Table 4-6 (attached) presents a summary of the proposed building heights to be included in the dispersion model.

## 4.7 Receptor Locations and Terrain

Dispersion factors will be determined for each modeling receptor outside the facility property boundary. MFA proposes to place modeling receptors along the facility boundary and at potential exposure locations in the surrounding area up to 5 kilometers away from the center of the facility. Figure 4-3 presents the proposed receptor spacing and locations for the modeling domain. Figure 4-4 presents the proposed receptor locations in the immediate area surrounding the facility.

Receptors will be defined in the dispersion model as shown in Table 4-7. If high impact areas are identified outside of the 50-meter grid upon review of modeled unit concentrations, MFA will place additional receptors in 25-meter space increments within applicable areas.

**Table 4-7. Proposed Receptor Locations**

Receptor Spacing	Receptor Distance
25 m	Along fence line and out to 500 m from fence line
50 m	500 m to 1,000 m
100 m	1,000 m to 2,000 m
200 m	2,000 m to 5,000 m

Additional receptors will be included in the model beyond the proposed 5,000 m receptor grid extent if risk is determined to be greater than the Source Permit Level at any receptor along the perimeter of the proposed receptor grid. This will ensure that all areas where predicted risk is at or above the Source Permit Level are accounted for in the model.

MFA identified two locations considered to be “sensitive exposure locations” (e.g., schools) within approximately 1-kilometer from the facility property boundary, which are presented in Table 4-8. Each sensitive exposure location shown in Table 4-8 will be accounted for in the dispersion model by the proposed receptor grid.

**Table 4-8. Identification of Sensitive Exposure Locations**

UTM Coordinates (m)		Sensitive Exposure Location
Easting	Northing	
497471.53	4972349.50	Morningside Elementary School
498121.53	4971849.50	Leslie Middle School

Terrain elevations for model receptors, TEU base elevations, and base elevations of downwash structures will be obtained from the USGS National Elevation Dataset at a resolution of 1/3 arc-seconds (a horizontal resolution of roughly 10 meters) and processed using the current version of AERMAP as shown in Table 4-1.

## 5 RISK ASSESSMENT WORK PLAN

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The following subsections detail the required elements for the RAWP.

### 5.1 Conceptual Site Model

Sections 2 through 4 discuss the facility location, process description, TEUs, and TAC emission estimates to satisfy the requirements for a conceptual site model set forth under OAR 340-245-0210(2)(a). Exposure locations are described in more detail in Section 5.2 below.

#### 5.1.1 Gas Combustion TEUs

The specific procedures for assessing the risk of each TEU is dependent 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.” Each boiler TEU (dispersion model IDs BLR\_1 and BLR\_2) represents a source of natural gas-fired combustion emissions only.

Dispersion model IDs are presented in Tables 3-1 through 3-4 (attached) with applicable TAC annual and daily emission rates. MFA will separately determine risk at each exposure location from gas combustion in the boiler TEUs identified above.

#### 5.1.2 Aggregated TEUs

A Level 3 Risk Assessment will be conducted that includes all facility TEUs other than those qualifying as gas combustion TEUs or exempt TEUs. This assessment will be used to determine whether the facility exceeds the source permit Risk Action Level (RAL) (i.e., de minimis source determination) per OAR 340-245-0050(7). After completion of the proposed Level 3 Risk Assessment, if it is determined that one of the predicted cancer or noncancer risks exceed the source permit RAL, PCA will determine 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.

Predicted cancer and noncancer risks will be reported separately for Gas Combustion TEUs, Aggregated TEUs (if any), and Significant TEUs (if any). Risks associated with Aggregated TEUs will be compared with the applicable Aggregated TEU RALs. For the compliance demonstration, only calculated risks associated with Significant TEUs will be compared with the applicable RALs.

## 5.2 Exposure Assessment

The following subsections detail the proposed exposure assessment for the facility.

### 5.2.1 Land-Use Zoning Classification—Exposure Types

In anticipation of dispersion modeling, the Department of Land Conservation and Development’s statewide zoning data were reviewed to determine land-use classifications for areas within the modeling domain. The Oregon statewide zoning classifications provide the basis for the initial categorization of exposure classifications (e.g. residential, non-residential worker, non-residential child, or acute), as shown in Table 5-1 (attached).

The zoning data was further evaluated against local data such as the City of Salem zoning and school-location information. MFA also reviewed aerial imagery via Esri ArcGIS and Google Earth software to determine whether the existing zoning information reflects actual land-use and the corresponding exposure type categorization.

The zoning data and internal MFA review process indicate that multiple proposed locations fall within roadway and/or rail rights-of-way interstitial spaces as shown (in black) in Figures 4-3 and 4-4. As requested by the DEQ, these locations are included in the dispersion modeling to maintain a uniform receptor grid. For receptors within the 25 meter and 50 meter receptor grids, MFA is not proposing to conduct risk evaluations for any receptor locations in roadways or rail rights-of-way consistent with the DEQ guidance. Note for receptors outside of the 50 meter receptor grid, all receptors will be evaluated for risk, even where the receptor is located in a right-of-way. In the crosswalk-of-receptors, which will be provided to the DEQ in spreadsheet format due to the large number of receptor locations, identified roadway and rail rights-of-way locations are labeled as “Risk Not Assessed,” even though they will be modeled and dispersion factors will be generated.

Figure 5-1 presents the existing land-use zoning identified for the modeling domain, and Figure 5-2 is provided for the area immediately surrounding the facility. Figures 5-3 and 5-4 present the corresponding exposure location categorization for the modeling domain and the immediate area surrounding the facility, respectively. For additional clarification, Table 5-2 (attached) presents each proposed receptor location where the determined land-use and exposure location classifications differ from the statewide zoning information.

## 5.2.2 Exposure Pathways

A Level 3 Risk Assessment is proposed in this RAWP. MFA assumes that predicted cancer and noncancer risk (i.e., chronic and acute hazard index) resulting from facility TEUs will not have additional exposure pathways (i.e., ingestion or injection) other than those already accounted for in each published 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 that require further analysis. Since no additional exposure pathways have been observed, MFA understands that a Level 4 Risk Assessment is not warranted.

## 5.3 Risk-Based Concentrations

Excess cancer risk and chronic and acute noncancer risk will be assessed using the current published RBCs shown in OAR 340-245-8040 Table 4. The TACs from the DEQ-approved emissions inventory and corresponding RBCs to be included in the proposed Level 3 Risk Assessment are presented in Table 5-3 (attached).

## 5.4 Risk Estimates

As described in Section 4.4, a single dispersion model will be executed to predict “dispersion factors” in units of  $\mu\text{g}/\text{m}^3$  per  $\text{g}/\text{s}$  for each exposure location and modeled averaging period. Risk will be calculated for each TEU by multiplying the dispersion factor at a given location by the TAC-specific emission rate ( $\text{g}/\text{s}$ ) presented in the DEQ-approved emission inventory, then dividing by the appropriate RBC. The resulting risk for each TAC will be summed for each individual TEU. The total risk at each TEU will then be summed at each exposure location to calculate the cumulative predicted excess cancer risk, chronic noncancer hazard index, and acute noncancer hazard index for the facility.

PCA is not currently proposing to assess noncancer risk by calculating separate hazard indices per noncancer target organ.

### 5.4.1 Example Calculation—Proposed Level 3 Risk Assessment

Example calculations for estimating excess cancer risk and noncancer hazard index (both chronic and acute) for a single exposure location are presented in Equation 1 and Equation 2 to satisfy the requirements set forth under OAR 340-245-0210(2)(c).

#### Equation 1.

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

#### Equation 2.

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

The cumulative 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.

## 5.4.2 Risk Action Levels

The results of the proposed Level 3 Risk Assessment will be compared to the current RALs published in OAR 340-245-8010 Table 1. As shown in the DEQ-approved emissions inventory, potential TAC emissions from the facility are comprised of a mixture of TACs with assigned hazard indices of 3 and 5 per OAR 340-245-8030 Table 3 and OAR 340-245-8040 Table 4, respectively. If cumulative risk estimates are determined to equal or exceed the Community Engagement RAL, a risk determination ratio will be calculated. If needed, the risk determination ratio formula presented in Equation 3 below will be used.

Equation 3.

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

## 5.5 Uncertainty Analysis

Although the proposed Level 3 Risk Assessment will be conducted using the most accurate and current information, 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 (i.e., acute hazard index), the full 24-hour exposure duration will be assumed. Acute exposure can occur anywhere from one to 24 hours. Although this risk assessment assumed 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. **Hence, for TACs with RBCs that were developed using toxicity reference values based on longer exposure durations, the Level 3 Risk Assessment may overestimate acute noncancer risk due to the 24-hour exposure duration assumption.**
- The proposed 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 boilers do not typically need to operate at maximum operational capacity to satisfy the steam requirements of the facility. 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 relies on modeling using a five-year period of hourly meteorological data. Some meteorological conditions, which may only occur a few days or less in a five-year period, result in worst-case dispersion characteristics. It is unlikely that these

infrequent meteorological conditions would occur at the same time that the 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 maximum capacity operation of the facility aligning with worst-case met conditions.**

- Dispersion modeling will be used to determine the daily (i.e. 24-hour) dispersion factors per exposure location for use in risk estimate calculations. This method determines, for each TEU, a single day within the one-year period of hourly met 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 each individual TEUs at the facility. For example, the highest predicted concentration for the TEU—Boilers may occur at exposure location “X” on March 1 while, due to differences in location, release characteristics (i.e., stack height, velocity, etc.), and met variation, the highest predicted concentration for the TEU—Ink may occur at exposure location “X” on December 1. Thus, the maximum predicted concentrations are not paired-in-time such that maximum predicted concentrations per TEU may occur on different days within the met 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 (i.e., 70 years). **Therefore, the proposed Level 3 Risk Assessment will overestimate cancer and chronic noncancer risk due to the unrealistic exposure duration assumption.**

#### **All Assessments:**

- Only TACs that have applicable RBCs published by the DEQ will be assessed. Table 5-4 (attached) presents a list of the TACs that could be emitted from the proposed 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 have an associated RBC. MFA understands the development of RBCs incorporates a level of conservatism that may overestimate cancer and/or noncancer risk from TACs with known RBCs.**



## 6 CLOSING

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MFA and PCA look forward to working with the DEQ throughout the CAO permit application process. If there are any questions or comments regarding this combined modeling protocol and RAWP, please contact Erica Frey-Hoyer of PCA at (503) 315-2335, or Eric Bornhorst. of MFA at (971) 713-3580.

## 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 3-1  
DEQ-Approved Annual Emission Rates—All TACs  
Packaging Corporation of America—Salem, Oregon

Toxic Air Contaminant	CAS	RBC? (Yes/No)	Annual Emission Estimates (Units)																								Total Facility Annual Emissions Estimate	
			Natural Gas Boilers (TEU-Boilers)						Material Balance (TEU-Ink and TEU-Glue)																			
			Total	Boiler 1		Boiler 2		Total	Building Vents																			
				No. 1		No. 2			No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9							
			(lb/yr) <sup>(1)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(1)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>
Model ID	--	--	--	BLR_1		BLR_2		--	VENT_1		VENT_2		VENT_3		VENT_4		VENT_5		VENT_6		VENT_7		VENT_8		VENT_9		--	--
Emissions Fraction Estimate <sup>(2)</sup>	--	--	--	0.50		0.50		--	0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		--	--
Arsenic and compounds	7440-38-2	Yes	0.050	0.025	3.6E-07	0.025	3.6E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.050	7.2E-07	
Barium and compounds	7440-39-3	No	1.10	0.55	7.9E-06	0.55	7.9E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.10	1.6E-05	
Beryllium and compounds	7440-41-7	Yes	3.0E-03	1.5E-03	2.2E-08	1.5E-03	2.2E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-03	4.3E-08	
Cadmium and compounds	7440-43-9	Yes	0.28	0.14	2.0E-06	0.14	2.0E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.28	4.0E-06	
Cobalt and compounds	7440-48-4	Yes	0.021	0.011	1.5E-07	0.011	1.5E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.021	3.0E-07	
Copper and compounds	7440-50-8	Yes	0.21	0.11	1.5E-06	0.11	1.5E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.21	3.1E-06	
Manganese and compounds	7439-96-5	Yes	0.095	0.048	6.9E-07	0.048	6.9E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.095	1.4E-06	
Mercury and compounds	7439-97-6	Yes	0.065	0.033	4.7E-07	0.033	4.7E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.065	9.4E-07	
Nickel and compounds	7440-02-0	Yes	0.53	0.26	3.8E-06	0.26	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.53	7.6E-06	
Selenium and compounds	7782-49-2	Yes	6.0E-03	3.0E-03	4.3E-08	3.0E-03	4.3E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.0E-03	8.7E-08	
Vanadium (fume or dust)	7440-62-2	Yes	0.58	0.29	4.1E-06	0.29	4.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.58	8.3E-06	
Zinc and compounds	7440-66-6	No	7.27	3.64	5.2E-05	3.64	5.2E-05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.27	1.0E-04	
1,4-Dioxane	123-91-1	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Acetaldehyde	75-07-0	Yes	--	--	--	--	--	4.31	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	4.31	6.2E-05
Benzene	71-43-2	Yes	0.53	0.26	3.8E-06	0.26	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.53	7.6E-06	
Butyl acrylate	141-32-2	No	--	--	--	--	--	1.69	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	1.69	2.4E-05
Isopropylbenzene (Cumene)	98-82-8	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Diethanolamine	111-42-2	Yes	--	--	--	--	--	2.26	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	2.26	3.2E-05
Diethylene glycol	111-46-6	No	--	--	--	--	--	1.69	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	0.19	2.7E-06	1.69	2.4E-05
Diethylene glycol monobutyl ether	112-34-5	Yes	--	--	--	--	--	102	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	102	1.5E-03
Diethylene glycol monoethyl ether	111-90-0	Yes	--	--	--	--	--	86.4	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	86.4	1.2E-03
Dipropylene glycol	25265-71-8	No	--	--	--	--	--	107	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	11.9	1.7E-04	107	1.5E-03
Ethylene glycol	107-21-1	Yes	--	--	--	--	--	50.3	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	50.3	7.2E-04
Ethylene glycol monobutyl ether	111-76-2	Yes	--	--	--	--	--	0.85	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.85	1.2E-05
Ethylene oxide	75-21-8	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Formaldehyde	50-00-0	Yes	18.8	9.40	1.4E-04	9.40	1.4E-04	34.5	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	53.3	7.7E-04
Hexane	110-54-3	Yes	451	226	3.2E-03	226	3.2E-03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	451	6.5E-03	
Isopropyl alcohol	67-63-0	Yes	--	--	--	--	--	466	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	466	6.7E-03
Methanol	67-56-1	Yes	--	--	--	--	--	34.5	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	34.5	5.0E-04
Acenaphthene	83-32-9	No	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Acenaphthylene	208-96-8	No	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Anthracene	120-12-7	No	6.0E-04	3.0E-04	4.3E-09	3.0E-04	4.3E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.0E-04	8.7E-09	
Benz[a]anthracene	56-55-3	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Benzo[a]pyrene	50-32-8	Yes	3.0E-04	1.5E-04	2.2E-09	1.5E-04	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-04	4.3E-09	
Benzo[b]fluoranthene	205-99-2	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Benzo[g,h,i]perylene	191-24-2	Yes	3.0E-04	1.5E-04	2.2E-09	1.5E-04	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-04	4.3E-09	
Benzo[k]fluoranthene	207-08-9	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Chrysene	218-01-9	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				

Table 3-2  
DEQ-Approved Daily Emission Rates—All TACs  
Packaging Corporation of America—Salem, Oregon

Toxic Air Contaminant	CAS	RBC? (Yes/No)	Daily Emission Estimates (Units)																								Total Facility Daily Emissions Estimate			
			Natural Gas Boilers (TEU-Boilers)						Material Balance (TEU-Ink and TEU-Glue)																					
			Total	Boiler 1		Boiler 2		Total	Building Vents																					
				No. 1	No. 2		No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9											
			(lb/day) <sup>(1)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(1)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day)	(g/s)
Model ID	--	--	--	BLR_1		BLR_2		--	VENT_1		VENT_2		VENT_3		VENT_4		VENT_5		VENT_6		VENT_7		VENT_8		VENT_9		--	--		
Emissions Fraction Estimate <sup>(2)</sup>	--	--	--	0.50		0.50		--	0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		--	--		
Arsenic and compounds	7440-38-2	Yes	1.4E-04	6.9E-05	3.6E-07	6.9E-05	3.6E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-04	7.2E-07		
Barium and compounds	7440-39-3	No	3.0E-03	1.5E-03	7.9E-06	1.5E-03	7.9E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-03	1.6E-05		
Beryllium and compounds	7440-41-7	Yes	8.2E-06	4.1E-06	2.2E-08	4.1E-06	2.2E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.2E-06	4.3E-08		
Cadmium and compounds	7440-43-9	Yes	7.6E-04	3.8E-04	2.0E-06	3.8E-04	2.0E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.6E-04	4.0E-06		
Cobalt and compounds	7440-48-4	Yes	5.8E-05	2.9E-05	1.5E-07	2.9E-05	1.5E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.8E-05	3.0E-07		
Copper and compounds	7440-50-8	Yes	5.8E-04	2.9E-04	1.5E-06	2.9E-04	1.5E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.8E-04	3.1E-06		
Manganese and compounds	7439-96-5	Yes	2.6E-04	1.3E-04	6.9E-07	1.3E-04	6.9E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.6E-04	1.4E-06		
Mercury and compounds	7439-97-6	Yes	1.8E-04	8.9E-05	4.7E-07	8.9E-05	4.7E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.8E-04	9.4E-07		
Nickel and compounds	7440-02-0	Yes	1.4E-03	7.2E-04	3.8E-06	7.2E-04	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-03	7.6E-06		
Selenium and compounds	7782-49-2	Yes	1.6E-05	8.2E-06	4.3E-08	8.2E-06	4.3E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E-05	8.7E-08		
Vanadium (fume or dust)	7440-62-2	Yes	1.6E-03	7.9E-04	4.1E-06	7.9E-04	4.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E-03	8.3E-06		
Zinc and compounds	7440-66-6	No	0.020	1.0E-02	5.2E-05	1.0E-02	5.2E-05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.020	1.0E-04		
1,4-Dioxane	123-91-1	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06		
Acetaldehyde	75-07-0	Yes	--	--	--	--	--	0.012	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	0.012	6.2E-05		
Benzene	71-43-2	Yes	1.4E-03	7.2E-04	3.8E-06	7.2E-04	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-03	7.6E-06		
Butyl acrylate	141-32-2	No	--	--	--	--	--	4.6E-03	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	4.6E-03	2.4E-05		
Isopropylbenzene (Cumene)	98-82-8	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06		
Diethanolamine	111-42-2	Yes	--	--	--	--	--	6.2E-03	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.2E-03	3.2E-05		
Diethylene glycol	111-46-6	No	--	--	--	--	--	4.6E-03	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	5.2E-04	2.7E-06	4.6E-03	2.4E-05		
Diethylene glycol monobutyl ether	112-34-5	Yes	--	--	--	--	--	0.28	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.28	1.5E-03		
Diethylene glycol monoethyl ether	111-90-0	Yes	--	--	--	--	--	0.24	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.24	1.2E-03		
Dipropylene glycol	25265-71-8	No	--	--	--	--	--	0.29	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.033	1.7E-04	0.29	1.5E-03		
Ethylene glycol	107-21-1	Yes	--	--	--	--	--	0.14	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.14	7.2E-04		
Ethylene glycol monobutyl ether	111-76-2	Yes	--	--	--	--	--	2.3E-03	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.3E-03	1.2E-05		
Ethylene oxide	75-21-8	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06		
Formaldehyde	50-00-0	Yes	0.052	0.026	1.4E-04	0.026	1.4E-04	0.095	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.15	7.7E-04		
Hexane	110-54-3	Yes	1.24	0.62	3.2E-03	0.62	3.2E-03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.24	6.5E-03		
Isopropyl alcohol	67-63-0	Yes	--	--	--	--	--	1.28	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	1.28	6.7E-03		
Methanol	67-56-1	Yes	--	--	--	--	--	0.095	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.095	5.0E-04		
Acenaphthene	83-32-9	No	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09		
Acenaphthylene	208-96-8	No	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09		
Anthracene	120-12-7	No	1.6E-06	8.2E-07	4.3E-09	8.2E-07	4.3E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E-06	8.7E-09		
Benz[a]anthracene	56-55-3	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--																				

Table 3-3  
DEQ-Approved Annual Emission Rates—RBC Only  
Packaging Corporation of America—Salem, Oregon

Toxic Air Contaminant	CAS	RBC? (Yes/No)	Annual Emission Estimates (Units)																						Total Facility Annual Emissions Estimate			
			Natural Gas Boilers (TEU-Boilers)						Material Balance (TEU-Ink and TEU-Glue)																			
			Total	Boiler 1		Boiler 2		Total	Building Vents																			
				No. 1		No. 2			No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9							
			(lb/yr) <sup>(1)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(1)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/yr)	(g/s)
Model ID	--	--	--	BLR_1		BLR_2		--	VENT_1		VENT_2		VENT_3		VENT_4		VENT_5		VENT_6		VENT_7		VENT_8		VENT_9		--	--
Emissions Fraction Estimate <sup>(2)</sup>	--	--	--	0.50		0.50		--	0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		--	--		
Arsenic and compounds	7440-38-2	Yes	0.050	0.025	3.6E-07	0.025	3.6E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.050	7.2E-07	
Beryllium and compounds	7440-41-7	Yes	3.0E-03	1.5E-03	2.2E-08	1.5E-03	2.2E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-03	4.3E-08	
Cadmium and compounds	7440-43-9	Yes	0.28	0.14	2.0E-06	0.14	2.0E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.28	4.0E-06	
Cobalt and compounds	7440-48-4	Yes	0.021	0.011	1.5E-07	0.011	1.5E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.021	3.0E-07	
Copper and compounds	7440-50-8	Yes	0.21	0.11	1.5E-06	0.11	1.5E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.21	3.1E-06	
Manganese and compounds	7439-96-5	Yes	0.095	0.048	6.9E-07	0.048	6.9E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.095	1.4E-06	
Mercury and compounds	7439-97-6	Yes	0.065	0.033	4.7E-07	0.033	4.7E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.065	9.4E-07	
Nickel and compounds	7440-02-0	Yes	0.53	0.26	3.8E-06	0.26	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.53	7.6E-06	
Selenium and compounds	7782-49-2	Yes	6.0E-03	3.0E-03	4.3E-08	3.0E-03	4.3E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.0E-03	8.7E-08	
Vanadium (fume or dust)	7440-62-2	Yes	0.58	0.29	4.1E-06	0.29	4.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.58	8.3E-06	
1,4-Dioxane	123-91-1	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Acetaldehyde	75-07-0	Yes	--	--	--	--	--	4.31	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	0.48	6.9E-06	4.31	6.2E-05
Benzene	71-43-2	Yes	0.53	0.26	3.8E-06	0.26	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.53	7.6E-06	
Isopropylbenzene (Cumene)	98-82-8	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Diethanolamine	111-42-2	Yes	--	--	--	--	--	2.26	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	0.25	3.6E-06	2.26	3.2E-05
Diethylene glycol monobutyl ether	112-34-5	Yes	--	--	--	--	--	102	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	11.3	1.6E-04	102	1.5E-03
Diethylene glycol monoethyl ether	111-90-0	Yes	--	--	--	--	--	86.4	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	9.60	1.4E-04	86.4	1.2E-03
Ethylene glycol	107-21-1	Yes	--	--	--	--	--	50.3	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	5.59	8.0E-05	50.3	7.2E-04
Ethylene glycol monobutyl ether	111-76-2	Yes	--	--	--	--	--	0.85	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.094	1.4E-06	0.85	1.2E-05
Ethylene oxide	75-21-8	Yes	--	--	--	--	--	0.17	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.019	2.8E-07	0.17	2.5E-06
Formaldehyde	50-00-0	Yes	18.8	9.40	1.4E-04	9.40	1.4E-04	34.5	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	53.3	7.7E-04
Hexane	110-54-3	Yes	451	226	3.2E-03	226	3.2E-03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	451	6.5E-03	
Isopropyl alcohol	67-63-0	Yes	--	--	--	--	--	466	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	51.8	7.4E-04	466	6.7E-03
Methanol	67-56-1	Yes	--	--	--	--	--	34.5	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	3.83	5.5E-05	34.5	5.0E-04
Benz[a]anthracene	56-55-3	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Benzo[a]pyrene	50-32-8	Yes	3.0E-04	1.5E-04	2.2E-09	1.5E-04	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-04	4.3E-09	
Benzo[b]fluoranthene	205-99-2	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Benzo[g,h,i]perylene	191-24-2	Yes	3.0E-04	1.5E-04	2.2E-09	1.5E-04	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-04	4.3E-09	
Benzo[k]fluoranthene	207-08-9	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Chrysene	218-01-9	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Dibenz[a,h]anthracene	53-70-3	Yes	3.0E-04	1.5E-04	2.2E-09	1.5E-04	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0E-04	4.3E-09	
Fluoranthene	206-44-0	Yes	7.5E-04	3.8E-04	5.4E-09	3.8E-04	5.4E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.5E-04	1.1E-08	
Indeno[1,2,3-cd]pyrene	193-39-5	Yes	4.5E-04	2.3E-04	3.2E-09	2.3E-04	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5E-04	6.5E-09	
Naphthalene	91-20-3	Yes	0.15	0.076	1.1E-06	0.076	1.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.15	2.2E-06	
Toluene	108-88-3	Yes	0.85	0.43	6.1E-06	0.43	6.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.85	1.2E-05	
Vinyl acetate	108-05-4	Yes	--	--	--	--	--	121	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	13.4	1.9E-04	121	1.7E-03
Total TAC Emissions Estimate			474	237	3.4E-03	237	3.4E-03	902	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	100	1.4E-03	1,376	0.020

NOTES:

- (a) Emission rate (lb/yr) = (total emissions estimate [lb/yr]) x (emissions fraction estimate)
- (b) Emission rate (g/s) = (annual emissions estimate [lb/yr]) x (453.592 g/lb) x (yr/8,760 hrs) x (hr/3,600 s)

REFERENCES:

- (1) Emissions estimate obtained from DEQ-approved emissions inventory per letter dated February 17, 2021.
- (2) Emissions fraction equally apportioned among ventilation points.

Table 3-4  
DEQ-Approved Daily Emission Rates—RBC Only  
Packaging Corporation of America—Salem, Oregon

Toxic Air Contaminant	CAS	RBC? (Yes/No)	Daily Emission Estimates (Units)																								Total Facility Daily Emissions Estimate	
			Natural Gas Boilers (TEU-Boilers)						Material Balance (TEU-Ink and TEU-Glue)																			
			Total	Boiler 1		Boiler 2		Total	Building Vents									No. 7		No. 8		No. 9						
				(lb/day) <sup>(1)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>		(g/s) <sup>(b)</sup>	(lb/yr) <sup>(1)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>	(lb/day) <sup>(a)</sup>	(g/s) <sup>(b)</sup>		
Model ID	--	--	--	BLR_1		BLR_2		--	VENT_1		VENT_2		VENT_3		VENT_4		VENT_5		VENT_6		VENT_7		VENT_8		VENT_9		--	--
Emissions Fraction Estimate <sup>(2)</sup>	--	--	--	0.50		0.50		--	0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		0.11		--	--
Arsenic and compounds	7440-38-2	Yes	1.4E-04	6.9E-05	3.6E-07	6.9E-05	3.6E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-04	7.2E-07
Beryllium and compounds	7440-41-7	Yes	8.2E-06	4.1E-06	2.2E-08	4.1E-06	2.2E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.2E-06	4.3E-08
Cadmium and compounds	7440-43-9	Yes	7.6E-04	3.8E-04	2.0E-06	3.8E-04	2.0E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.6E-04	4.0E-06
Cobalt and compounds	7440-48-4	Yes	5.8E-05	2.9E-05	1.5E-07	2.9E-05	1.5E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.8E-05	3.0E-07
Copper and compounds	7440-50-8	Yes	5.8E-04	2.9E-04	1.5E-06	2.9E-04	1.5E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.8E-04	3.1E-06
Manganese and compounds	7439-96-5	Yes	2.6E-04	1.3E-04	6.9E-07	1.3E-04	6.9E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.6E-04	1.4E-06
Mercury and compounds	7439-97-6	Yes	1.8E-04	8.9E-05	4.7E-07	8.9E-05	4.7E-07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.8E-04	9.4E-07
Nickel and compounds	7440-02-0	Yes	1.4E-03	7.2E-04	3.8E-06	7.2E-04	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-03	7.6E-06
Selenium and compounds	7782-49-2	Yes	1.6E-05	8.2E-06	4.3E-08	8.2E-06	4.3E-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E-05	8.7E-08
Vanadium (fume or dust)	7440-62-2	Yes	1.6E-03	7.9E-04	4.1E-06	7.9E-04	4.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E-03	8.3E-06
1,4-Dioxane	123-91-1	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06
Acetaldehyde	75-07-0	Yes	--	--	--	--	--	0.012	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	1.3E-03	6.9E-06	0.012	6.2E-05
Benzene	71-43-2	Yes	1.4E-03	7.2E-04	3.8E-06	7.2E-04	3.8E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.4E-03	7.6E-06
Isopropylbenzene (Cumene)	98-82-8	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06
Diethanolamine	111-42-2	Yes	--	--	--	--	--	6.2E-03	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.9E-04	3.6E-06	6.2E-03	3.2E-05
Diethylene glycol monobutyl ether	112-34-5	Yes	--	--	--	--	--	0.28	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.031	1.6E-04	0.28	1.5E-03
Diethylene glycol monoethyl ether	111-90-0	Yes	--	--	--	--	--	0.24	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.026	1.4E-04	0.24	1.2E-03
Ethylene glycol	107-21-1	Yes	--	--	--	--	--	0.14	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.015	8.0E-05	0.14	7.2E-04
Ethylene glycol monobutyl ether	111-76-2	Yes	--	--	--	--	--	2.3E-03	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.6E-04	1.4E-06	2.3E-03	1.2E-05
Ethylene oxide	75-21-8	Yes	--	--	--	--	--	4.7E-04	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	5.3E-05	2.8E-07	4.7E-04	2.5E-06
Formaldehyde	50-00-0	Yes	0.052	0.026	1.4E-04	0.026	1.4E-04	0.095	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.15	7.7E-04
Hexane	110-54-3	Yes	1.24	0.62	3.2E-03	0.62	3.2E-03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.24	6.5E-03
Isopropyl alcohol	67-63-0	Yes	--	--	--	--	--	1.28	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	0.14	7.4E-04	1.28	6.7E-03
Methanol	67-56-1	Yes	--	--	--	--	--	0.095	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.011	5.5E-05	0.095	5.0E-04
Benz[a]anthracene	56-55-3	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09
Benzo[a]pyrene	50-32-8	Yes	8.2E-07	4.1E-07	2.2E-09	4.1E-07	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.2E-07	4.3E-09
Benzo[b]fluoranthene	205-99-2	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09
Benzo[g,h,i]perylene	191-24-2	Yes	8.2E-07	4.1E-07	2.2E-09	4.1E-07	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.2E-07	4.3E-09
Benzo[k]fluoranthene	207-08-9	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09
Chrysene	218-01-9	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09
Dibenz[a,h]anthracene	53-70-3	Yes	8.2E-07	4.1E-07	2.2E-09	4.1E-07	2.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.2E-07	4.3E-09
Fluoranthene	206-44-0	Yes	2.1E-06	1.0E-06	5.4E-09	1.0E-06	5.4E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.1E-06	1.1E-08
Indeno[1,2,3-cd]pyrene	193-39-5	Yes	1.2E-06	6.2E-07	3.2E-09	6.2E-07	3.2E-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2E-06	6.5E-09
Naphthalene	91-20-3	Yes	4.2E-04	2.1E-04	1.1E-06	2.1E-04	1.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.2E-04	2.2E-06
Toluene	108-88-3	Yes	2.3E-03	1.2E-03	6.1E-06	1.2E-03	6.1E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.3E-03	1.2E-05
Vinyl acetate	108-05-4	Yes	--	--	--	--	--	0.33	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.037	1.9E-04	0.33	1.7E-03
Total TAC Emissions Estimate			1.30	0.65	3.4E-03	0.65	3.4E-03	2.47	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	0.27	1.4E-03	3.77	0.020

NOTES:  
(a) Emission rate (lb/day) = (total emissions estimate [lb/day]) x (emissions fraction estimate)  
(b) Emission rate (g/s) = (daily emissions estimate [lb/day]) x (453.592 g/lb) x (day/24 hrs) x (hr/3,600 s)

REFERENCES:  
(1) Emissions estimate obtained from DEQ-approved emissions inventory per letter dated February 17, 2021.  
(2) Emissions fraction equally apportioned among ventilation points.

**Table 3-5**  
**Proposed Model Source Parameters**  
**Packaging Corporation of America—Salem, Oregon**

Point Sources											
Model ID	Model Source Description	UTM Coordinates <sup>(1)</sup>		Emission Rate <sup>(2)</sup> (g/s)	Discharge Orientation <sup>(1)</sup>	Base Elevation <sup>(3)</sup> (m)	Release Height <sup>(1)</sup> (m)	Stack Diameter <sup>(1)</sup> (m)	Exit Velocity <sup>(1)</sup> (m/s)	Exit Flowrate <sup>(a)</sup> (m <sup>3</sup> /s)	Exit Temperature <sup>(1)</sup> (K)
		Eastings	Northing								
VENT_1	Roll Pit Area 1 of 3	498,557.14	4,972,695.1	1.00	Vertical	61.4	10.77	1.22	7.60	8.87	Ambient
VENT_2	Roll Pit Area 2 of 3	498,587.45	4,972,668.2	1.00	Vertical	61.7	10.77	1.22	7.60	8.87	Ambient
VENT_3	Roll Pit Area 3 of 3	498,621.94	4,972,637.6	1.00	Vertical	61.5	10.77	1.22	7.60	8.87	Ambient
VENT_4	Corrugator Area 1 of 3	498,547.38	4,972,684.7	1.00	Capped	61.3	10.77	1.22	7.60	8.87	Ambient
VENT_5	Corrugator Area 2 of 3	498,577.81	4,972,658.5	1.00	Capped	61.7	10.77	1.22	7.60	8.87	Ambient
VENT_6	Corrugator Area 3 of 3	498,612.68	4,972,627.4	1.00	Capped	61.6	10.77	1.22	7.60	8.87	Ambient
VENT_7	Production Floor Area 1 of 3	498,516.31	4,972,648.7	1.00	Vertical	61.4	10.77	1.22	7.60	8.87	Ambient
VENT_8	Production Floor Area 2 of 3	498,547.24	4,972,623.4	1.00	Vertical	61.9	10.77	1.22	7.60	8.87	Ambient
VENT_9	Production Floor Area 3 of 3	498,581.74	4,972,591.9	1.00	Vertical	61.9	10.77	1.22	7.60	8.87	Ambient
BLR_1	Boiler Stack 1 of 2	498,573.37	4,972,643.6	1.00	Capped	61.8	12.95	0.56	5.39	1.32	455.4
BLR_2	Boiler Stack 2 of 2	498,576.03	4,972,642.1	1.00	Capped	61.8	11.28	0.51	6.53	1.32	455.4

NOTES:

m/s = meters per second.

m<sup>3</sup>/s = cubic meters per second.

(a) Exit flowrate (m<sup>3</sup>/s) = (π/4) x (stack diameter [m])<sup>2</sup> x (exit velocity [m/s])

REFERENCES:

(1) Value based on information provided by Packaging Corporation of America.

(2) Dispersion model will be executed using unit emission rates.

(3) Base elevation derived from the US Geological Survey National Elevation Dataset processed in AERMAP utility.



**Table 4-3**  
**Assessment of Missing Meteorological Data**  
**Packaging Corporation of America—Salem, Oregon**

Quarter <sup>(1)</sup>	Meteorological Data Assessment by Year														
	2016			2017			2018			2019			2020		
	Total Hours <sup>(1)</sup>	Missing Hours <sup>(2)</sup>	Available <sup>(a)</sup> (%)	Total Hours <sup>(1)</sup>	Missing Hours <sup>(2)</sup>	Available <sup>(a)</sup> (%)	Total Hours <sup>(1)</sup>	Missing Hours <sup>(2)</sup>	Available <sup>(a)</sup> (%)	Total Hours <sup>(1)</sup>	Missing Hours <sup>(2)</sup>	Available <sup>(a)</sup> (%)	Total Hours <sup>(1)</sup>	Missing Hours <sup>(2)</sup>	Available <sup>(a)</sup> (%)
Q1	2,184	3	99.9%	2,160	0	100.0%	2,160	14	99.4%	2,160	11	99.5%	2,184	12	99.5%
Q2	2,184	58	97.3%	2,184	132	94.0%	2,184	60	97.3%	2,184	0	100.0%	2,184	3	99.9%
Q3	2,208	59	97.3%	2,208	32	98.6%	2,208	3	99.9%	2,208	20	99.1%	2,208	0	100.0%
Q4	2,208	10	99.5%	2,208	10	99.5%	2,208	10	99.5%	2,208	9	99.6%	2,208	62	97.2%

NOTES:

(a) Available hours (%) = (1 - [missing hours / total hours]) x (100%)

REFERENCES:

- (1) Total hours obtained from the surface and profile files generated using AERMET (version 19191) for the period between 2016 and 2020. The combined 5-year meteorological dataset is representative of the Salem McNary Airport meteorological monitoring station (WBAN: 24232).
- (2) The number of missing hours was determined using the QA feature in Lakes Environmental software.

**Table 4-4**  
**AERSURFACE Settings**  
**Packaging Corporation of America—Salem, Oregon**

Parameter	Setting
Study radius for surface roughness	1.0 kilometer
Are the surface data collected at an airport?	Yes
Should continuous snow cover be assumed?	No
Is this an arid region?	No
Is this an airport site?	Yes
Number of sectors	12
Months assumed to constitute "winter"	December, January, and February
Months assumed to constitute "spring"	March, April, and May
Months assumed to constitute "summer"	June, July, and August
Months assumed to constitute "autumn"	September, October, and November
Period for land use calculations	Monthly

**Table 4-5**  
**Surface Soil Moisture Condition Assessment**  
**Packaging Corporation of America—Salem, Oregon**

Calendar Year	Annual Precipitation <sup>(1)</sup> (in)	Climatic Significance <sup>(2)</sup>	Calendar Year Soil Moisture <sup>(3)</sup> (in)
2016	47.01	Upper 70th Percentile	Wet
2017	50.91	Upper 70th Percentile	Wet
2018	31.02	Lower 30th Percentile	Dry
2019	30.86	Lower 30th Percentile	Dry
2020	33.78	Middle 40th Percentile	Average

30-Year Climate Precipitation Data <sup>(4)</sup>	
Average Annual Precipitation <sup>(5)</sup>	40.03
Lower 30th Percentile Annual Precipitation <sup>(6)</sup>	33.75
Upper 70th Percentile Annual Precipitation <sup>(7)</sup>	46.06

REFERENCES:

- (1) Annual precipitation data obtained from the National Oceanic and Atmospheric Administration National Climatic Data Center for Salem McNary meteorological monitoring station located in Salem, Oregon (WBAN: 24232).
- (2) Climatic significance represents annual precipitation compared to 30-year climatological period.
- (3) Surface moisture conditions correspond to "Dry", "Average" or "Wet" soil content determined by comparing annual precipitation to 30-year climatological period. This method is consistent with the methodology set forth in the current version of the EPA AERSURFACE User's Guide dated February 2020.
- (4) Represents 30-year period between 1991 and 2020. Period chosen as most current 30-year period available.
- (5) Represents average annual precipitation during 30-year climatological period.
- (6) Represents lower limit of middle 40th percentile annual precipitation during 30-year climatological period.
- (7) Represents upper limit of middle 40th percentile annual precipitation during 30-year climatological period.

**Table 4-6**  
**Summary of Downwash Structure Heights**  
**Packaging Corporation of America—Salem, Oregon**

Downwash Structure Model ID	Base Elevation <sup>(1)</sup>		Number of Building Tiers	Tier Height <sup>(2)</sup>	
	(ft)	(m)		(ft)	(m)
BLD_1	203	61.8	1	30.0	9.14
BLD_2	204	62.3	1	16.0	4.88
BLD_3	201	61.2	1	20.0	6.10
BLD_4	200	61.0	1	16.0	4.88

REFERENCES:

- (1) Base elevation derived from United States Geological Survey National Elevation Data (1/3-arc second resolution) using AERMAP.
- (2) Value based on information provided by Packaging Corporation of America.

**Table 5-1**  
**Summary of Statewide Zoning and Exposure Type Classification**  
**Packaging Corporation of America—Salem, Oregon**

Oregon Statewide Zoning Descriptions <sup>(1)</sup>	Corresponding Exposure Type Classification	Risk Assessments To Be Performed
Beaches and Dunes	Acute-only	Acute Noncancer
Coastal Estuarine	Acute-only	Acute Noncancer
Coastal Shorelands	Acute-only	Acute Noncancer
Combo equal emphasis	Acute-only	Acute Noncancer
Combo with priority emphasis	Acute-only	Acute Noncancer
Federal Forest	Acute-only	Acute Noncancer
Federal Range	Acute-only	Acute Noncancer
Forest	Acute-only	Acute Noncancer
No Data	Acute-only	Acute Noncancer
Open Space/Conservation	Acute-only	Acute Noncancer
Other	Acute-only	Acute Noncancer
Parks & Open Space	Acute-only	Acute Noncancer
Prime Forest 80	Acute-only	Acute Noncancer
Secondary Forest 80	Acute-only	Acute Noncancer
Industrial - Heavy	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Industrial - Light	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Industrial Campus	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Industrial Office	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Marginal Farm Land 10+	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Mineral and Aggregate	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Rural Commercial	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Rural Industrial	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
UC Rural Commercial	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
UC Rural Industrial	Non-Residential Worker	Cancer, Chronic and Acute Noncancer
Commercial - Central	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Commercial - General	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Commercial - Neighborhood	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Commercial - Office	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Public & semi-public Uses	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Public Facilities	Non-Residential Worker or Child (if applicable)	Cancer, Chronic and Acute Noncancer
Future Urban Development	Residential	Cancer, Chronic and Acute Noncancer
High-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Indian reservation/tribal trust	Residential	Cancer, Chronic and Acute Noncancer
Low-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Medium High-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Medium Low-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Medium-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. Extremely High	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. High	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. Low	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. Med-high	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. Medium	Residential	Cancer, Chronic and Acute Noncancer
Mixed-Use Com. & Res. V.High	Residential	Cancer, Chronic and Acute Noncancer
Rural Residential 1 acre	Residential	Cancer, Chronic and Acute Noncancer
Rural Residential 10 acres	Residential	Cancer, Chronic and Acute Noncancer
Rural Residential 2-4 acres	Residential	Cancer, Chronic and Acute Noncancer
Rural Residential 5 acres	Residential	Cancer, Chronic and Acute Noncancer
Very High-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Very Low-density Res.	Residential	Cancer, Chronic and Acute Noncancer
Exclusive Farm Use 160+	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Exclusive Farm Use 20+	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Exclusive Farm Use 40+	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Exclusive Farm Use 80	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Mixed Farm-Forest 160+	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Mixed Farm-Forest 20	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Mixed Farm-Forest 40	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer
Mixed Farm-Forest 80	Residential for structure, Non-Residential Worker for property	Cancer, Chronic and Acute Noncancer

REFERENCES:

(1) Oregon statewide zoning descriptions obtained from the Department of Land Conservation and Development statewide zoning dataset.

**Table 5-2**  
**Summary of Revisions to Statewide Zoning**  
**Packaging Corporation of America—Salem, Oregon**

UTM Coordinates (m)		Statewide Zoning for Exposure Classification	Exposure Type Classification	Reason for Exposure Type Classification Revision
Easting	Northing			
498596.53	4972724.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498621.53	4972699.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498646.53	4972674.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498671.53	4972649.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498696.53	4972599.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
497821.53	4973249.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497771.53	4973249.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497721.53	4973249.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497671.53	4973249.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497671.53	4973399.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497671.53	4973599.5	Commercial - General	Residential	Revised to residential based on aerial imagery.
497671.53	4973649.5	Commercial - General	Residential	Revised to residential based on aerial imagery.
497621.53	4973199.5	Commercial - General	Residential	Revised to residential based on aerial imagery.
497621.53	4973399.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
497621.53	4973449.5	Commercial - Office	Residential	Revised to residential based on aerial imagery.
498671.53	4974149.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery.
498771.53	4974049.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery.
498771.53	4974149.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery.
498871.53	4974049.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery.
498871.53	4974149.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery.
499971.53	4973549.5	Parks & Open Space	Worker	Revised to worker based on aerial imagery.
499971.53	4973449.5	Parks & Open Space	Worker	Revised to worker based on aerial imagery.
499971.53	4973349.5	Parks & Open Space	Worker	Revised to worker based on aerial imagery.
499971.53	4973249.5	Parks & Open Space	Worker	Revised to worker based on aerial imagery.
500071.53	4973249.5	Parks & Open Space	Worker	Revised to worker based on aerial imagery.
497971.53	4975449.5	Medium High-density Res.	Child	Revised to child due to school location.
501771.53	4977649.5	Medium Low-density Res.	Child	Revised to child due to school location.
500771.53	4972249.5	Commercial - General	Residential	Revised to residential based on aerial imagery.
502771.53	4973049.5	Medium Low-density Res.	Child	Revised to child due to school location.
503171.53	4967649.5	Other	Residential	Revised to residential based on aerial imagery.
503371.53	4967649.5	Other	Residential	Revised to residential based on aerial imagery.
503571.53	4967649.5	Other	Residential	Revised to residential based on aerial imagery.
499771.53	4969049.5	Medium Low-density Res.	Child	Revised to child due to school location.
499771.53	4968849.5	Medium Low-density Res.	Child	Revised to child due to school location.

**Table 5-2**  
**Summary of Revisions to Statewide Zoning**  
**Packaging Corporation of America—Salem, Oregon**

UTM Coordinates (m)		Statewide Zoning for Exposure Classification	Exposure Type Classification	Reason for Exposure Type Classification Revision
Easting	Northing			
498171.53	4967849.5	Medium Low-density Res.	Child	Revised to child due to school location.
497971.53	4967849.5	Medium Low-density Res.	Child	Revised to child due to school location.
496371.53	4969449.5	Medium Low-density Res.	Child	Revised to child due to school location.
496171.53	4969449.5	Medium Low-density Res.	Child	Revised to child due to school location.
494971.53	4969049.5	Medium Low-density Res.	Child	Revised to child due to school location.
494171.53	4970449.5	Medium Low-density Res.	Child	Revised to child due to school location.
494171.53	4970249.5	Medium Low-density Res.	Child	Revised to child due to school location.
496371.53	4971449.5	Medium Low-density Res.	Child	Revised to child due to school location.
495971.53	4977649.5	Commercial - General	Residential	Revised to residential based on aerial imagery.
498564.71	4972490.1	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498549.81	4972755.96	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498705.78	4972617.68	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498567.14	4972740.6	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498584.47	4972725.23	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498601.8	4972709.87	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498619.13	4972694.5	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498636.46	4972679.14	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498653.79	4972663.77	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498671.12	4972648.41	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498688.45	4972633.04	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498688.15	4972601.73	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498670.51	4972585.79	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498652.88	4972569.84	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498635.24	4972553.89	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498617.61	4972537.94	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498599.98	4972521.99	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498582.34	4972506.05	Industrial Office	Risk Not Assessed	Receptor location is within right-of-way in the 25 m or 50 m grid
498671.53	4974049.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery and DEQ request.
498771.53	4973949.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery and DEQ request.
498671.53	4973949.5	Industrial - Heavy	Residential	Revised to residential based on aerial imagery and DEQ request.
498021.53	4972999.5	Commercial - Office	Residential	Revised to residential based on aerial imagery and DEQ request.
497971.53	4972999.5	Commercial - Office	Residential	Revised to residential based on aerial imagery and DEQ request.
497921.53	4972999.5	Commercial - Office	Residential	Revised to residential based on aerial imagery and DEQ request.

**Table 5-3**  
**Applicable Risk-Based Concentrations**  
**Packaging Corporation of America—Salem, Oregon**

Toxic Air Contaminant	CAS	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
Arsenic and compounds	7440-38-2	HI3	2.4E-05	1.7E-04	1.3E-03	2.4E-03	6.2E-04	2.4E-03	0.20
Beryllium and compounds	7440-41-7	HI3	4.2E-04	7.0E-03	0.011	0.031	5.0E-03	0.031	0.020
Cadmium and compounds	7440-43-9	HI3	5.6E-04	5.0E-03	0.014	0.037	6.7E-03	0.037	0.030
Cobalt and compounds	7440-48-4	HI3	--	0.10	--	0.44	--	0.44	--
Copper and compounds	7440-50-8	HI3	--	--	--	--	--	--	100
Manganese and compounds	7439-96-5	HI3	--	0.090	--	0.40	--	0.40	0.30
Mercury and compounds	7439-97-6	HI3	--	0.077	--	0.63	--	0.63	0.60
Nickel and compounds	7440-02-0	HI3	3.8E-03	0.014	0.10	0.062	0.046	0.062	0.20
Selenium and compounds	7782-49-2	HI3	--	--	--	--	--	--	2.0
Vanadium (fume or dust)	7440-62-2	HI3	--	0.10	--	0.44	--	0.44	0.80
1,4-Dioxane	123-91-1	HI3	0.20	30	5.2	130	2.4	130	7,200
Acetaldehyde	75-07-0	HI3	0.45	140	12.0	620	5.5	620	470
Benzene	71-43-2	HI3	0.13	3.0	3.3	13	1.5	13	29
Isopropylbenzene (Cumene)	98-82-8	HI3	--	400	--	1,800	--	1,800	--
Diethanolamine	111-42-2	HI3	--	0.20	--	0.88	--	0.88	--
Diethylene glycol monobutyl ether	112-34-5	HI3	--	0.10	--	0.44	--	0.44	--
Diethylene glycol monoethyl ether	111-90-0	HI5	--	0.30	--	1.3	--	1.3	--
Ethylene glycol	107-21-1	HI3	--	400	--	1,800	--	1,800	2,000
Ethylene glycol monobutyl ether	111-76-2	HI3	--	82	--	360	--	360	29,000
Ethylene oxide	75-21-8	HI3	2.0E-04	30	2.1E-03	130	4.0E-03	130	160
Formaldehyde	50-00-0	HI3	0.17	9.0	4.3	40	2.0	40	49
Hexane	110-54-3	HI3	--	700	--	3,100	--	3,100	--
Isopropyl alcohol	67-63-0	HI3	--	200	--	880	--	880	3,200
Methanol	67-56-1	HI3	--	4,000	--	18,000	--	18,000	28,000
Benz[a]anthracene	56-55-3	--	2.1E-04	--	7.8E-03	--	0.015	--	--
Benzo[a]pyrene	50-32-8	HI3	4.3E-05	2.0E-03	1.6E-03	8.8E-03	3.0E-03	8.8E-03	2.0E-03
Benzo[b]fluoranthene	205-99-2	--	5.3E-05	--	2.0E-03	--	3.8E-03	--	--
Benzo[g,h,i]perylene	191-24-2	--	4.7E-03	--	0.17	--	0.34	--	--
Benzo[k]fluoranthene	207-08-9	--	1.4E-03	--	0.052	--	0.10	--	--
Chrysene	218-01-9	--	4.3E-04	--	0.016	--	0.030	--	--
Dibenz[a,h]anthracene	53-70-3	--	4.3E-06	--	1.6E-04	--	3.0E-04	--	--
Fluoranthene	206-44-0	--	5.3E-04	--	0.020	--	0.038	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	--	6.1E-04	--	0.022	--	0.043	--	--
Naphthalene	91-20-3	HI3	0.029	3.7	0.76	16	0.35	16	200
Toluene	108-88-3	HI3	--	5,000	--	22,000	--	22,000	7,500
Vinyl acetate	108-05-4	HI3	--	200	--	880	--	880	200

REFERENCES:

(1) See Oregon Administrative Rule 340-245-8040 Table 4.



**Table 5-4**  
**List of TACs With No Published Risk-Based Concentrations**  
**Packaging Corporation of America—Salem, Oregon**

Toxic Air Contaminant <sup>(1)</sup>	CAS	Risk-Based Concentration? <sup>(2)</sup> (Yes/No)
Barium and compounds	7440-39-3	No
Zinc and compounds	7440-66-6	No
Butyl acrylate	141-32-2	No
Diethylene glycol	111-46-6	No
Dipropylene glycol	25265-71-8	No
Acenaphthene	83-32-9	No
Acenaphthylene	208-96-8	No
Anthracene	120-12-7	No
Fluorene	86-73-7	No
2-Methyl naphthalene	91-57-6	No
Phenanthrene	85-01-8	No
Pyrene	129-00-0	No
7,12-Dimethylbenz[a]anthracene	57-97-6	No
3-Methylcholanthrene	56-49-5	No

REFERENCES:

- (1) See Oregon Administrative Rule 340-245-8020 Table 2.
- (2) See Oregon Administrative Rule 340-245-8040 Table 4.

# FIGURES



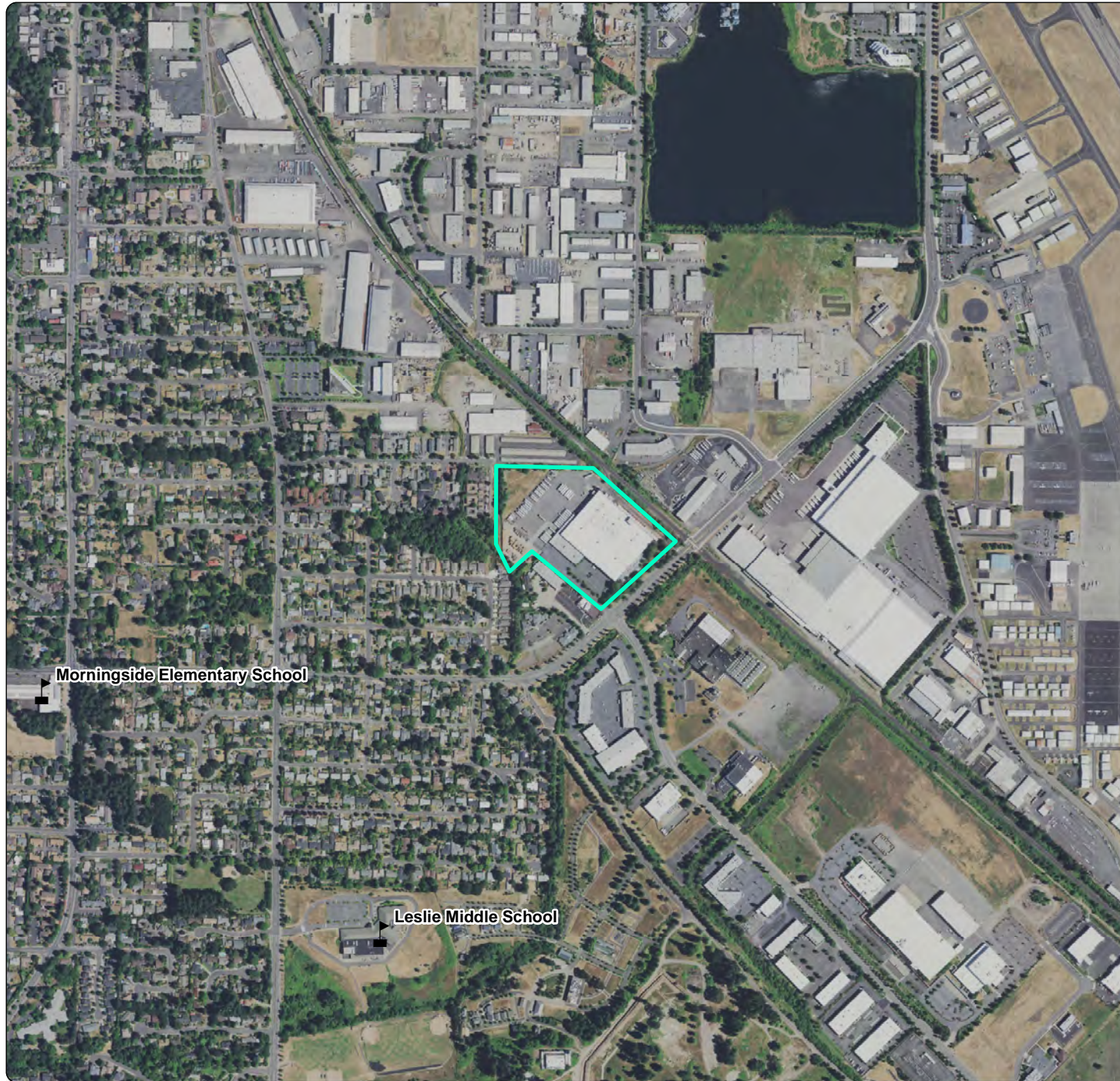




Figure 2-1  
Aerial Photograph  
of Facility  
Packaging Corporation  
of America  
Salem, OR

#### Legend

-  School Location (2015-16)
-  Property Boundary

#### Key Map



0 70 140  
Meters



Source:  
Aerial photograph obtained from ESRI  
ArcGIS Online.



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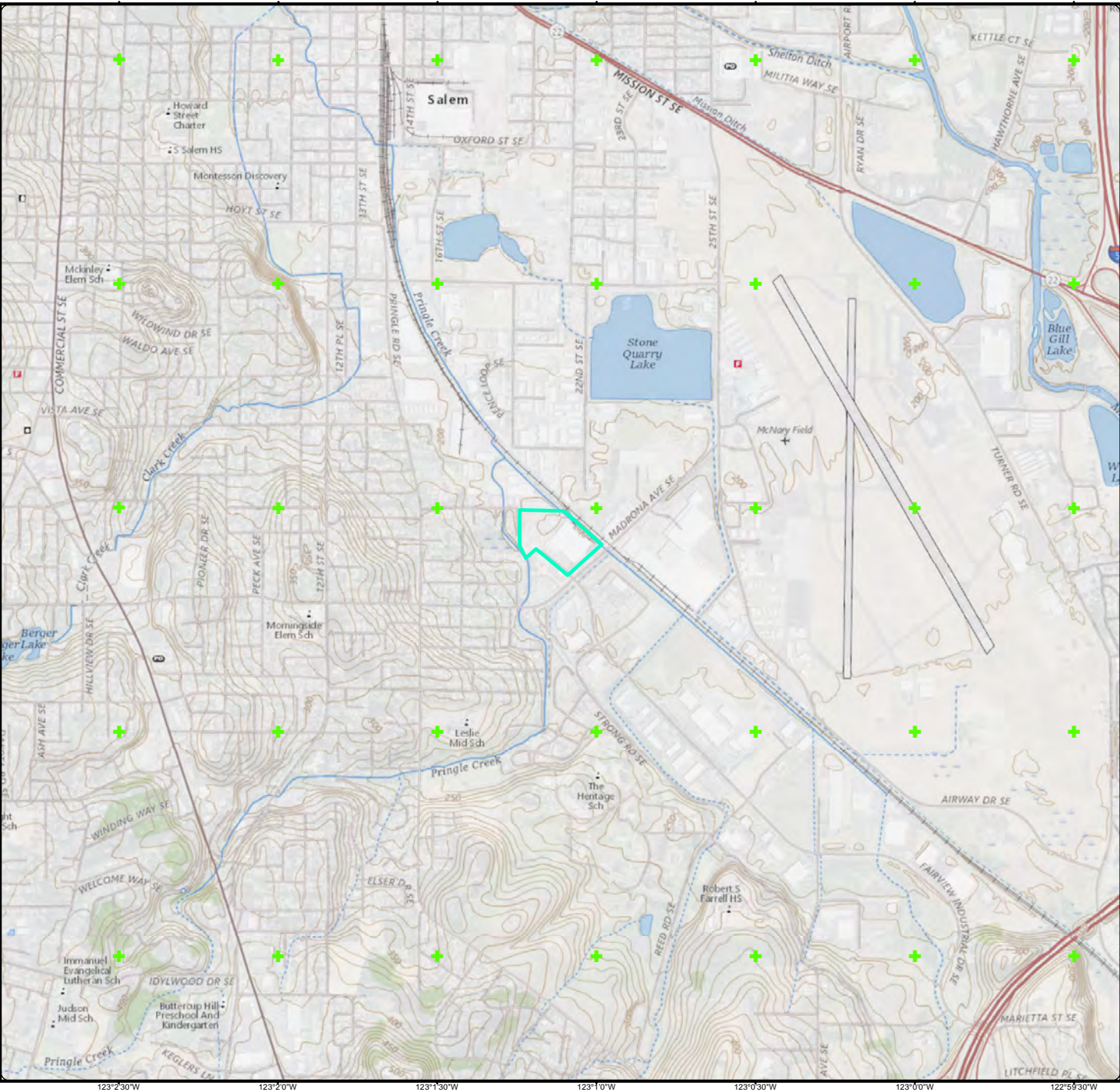


Figure 2-2  
Local Topography

Packaging Corporation  
of America  
Salem, OR

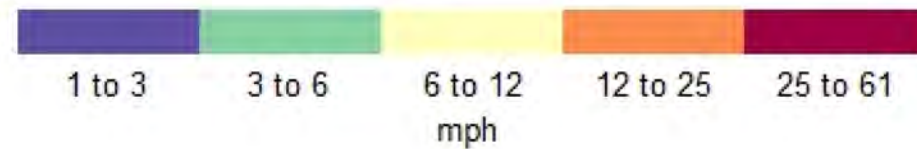
- Legend
- + UTM Grid Guideline
  - Property Boundary



Source:  
USGS Topographic basemap obtained from  
ArcGIS Online.

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Packaging Corporation of America  
Salem, OR

Meteorological data obtained from the Salem McNary Regional Airport monitoring station (ID 24232) for the period between January 1, 2016 to December 31, 2020.



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Reviewed By: E. Bonhost  
Produced By: apuse  
Project: 1831\_01  
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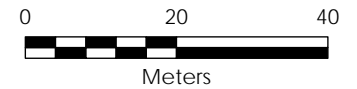


Figure 4-2  
Proposed Downwash  
Structures and Emission  
Unit Locations  
Packaging Corporation of America  
Salem, OR

Legend

- + UTM Grid Guideline
- Point Sources
- Proposed Downwash Structure
- Property Boundary

Key Map



Source:  
Aerial photograph obtained from  
ESRI ArcGIS Online.



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Produced By: aguse  
Project: 1831.01

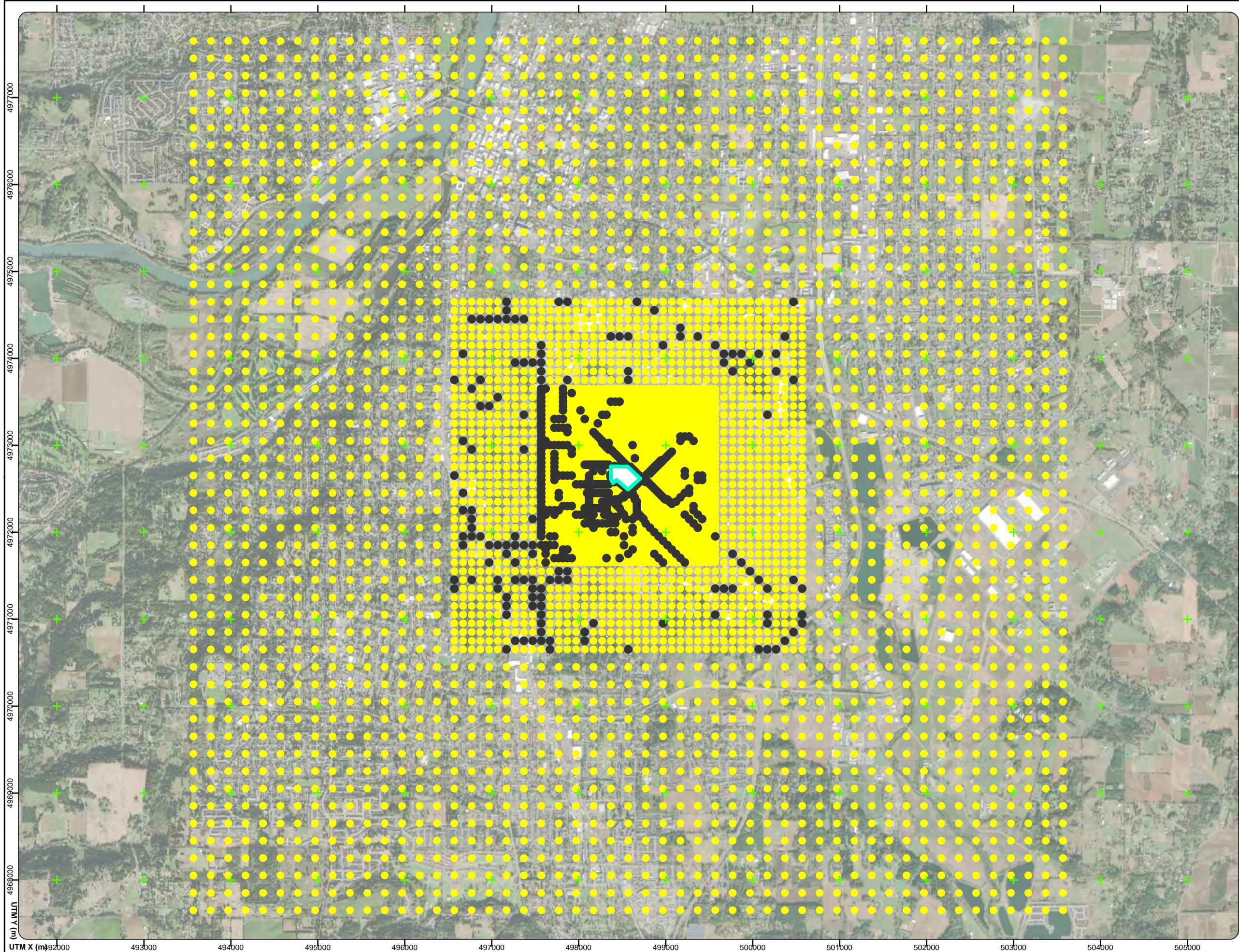
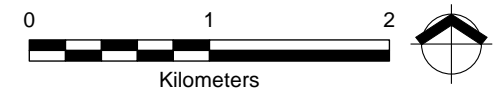


Figure 4-3  
Proposed Receptor  
Locations  
Packaging Corporation of America  
Salem, OR

- Legend
- UTM Grid Guideline
  - Proposed Receptor
  - Proposed Receptor in Road or Rail Right-of-Way
  - Property Boundary
  - Blanking Boundary



Sources: Aerial photograph obtained from Esri  
ArcGIS Online.



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Produced By: aguse  
Project: 1831\_01

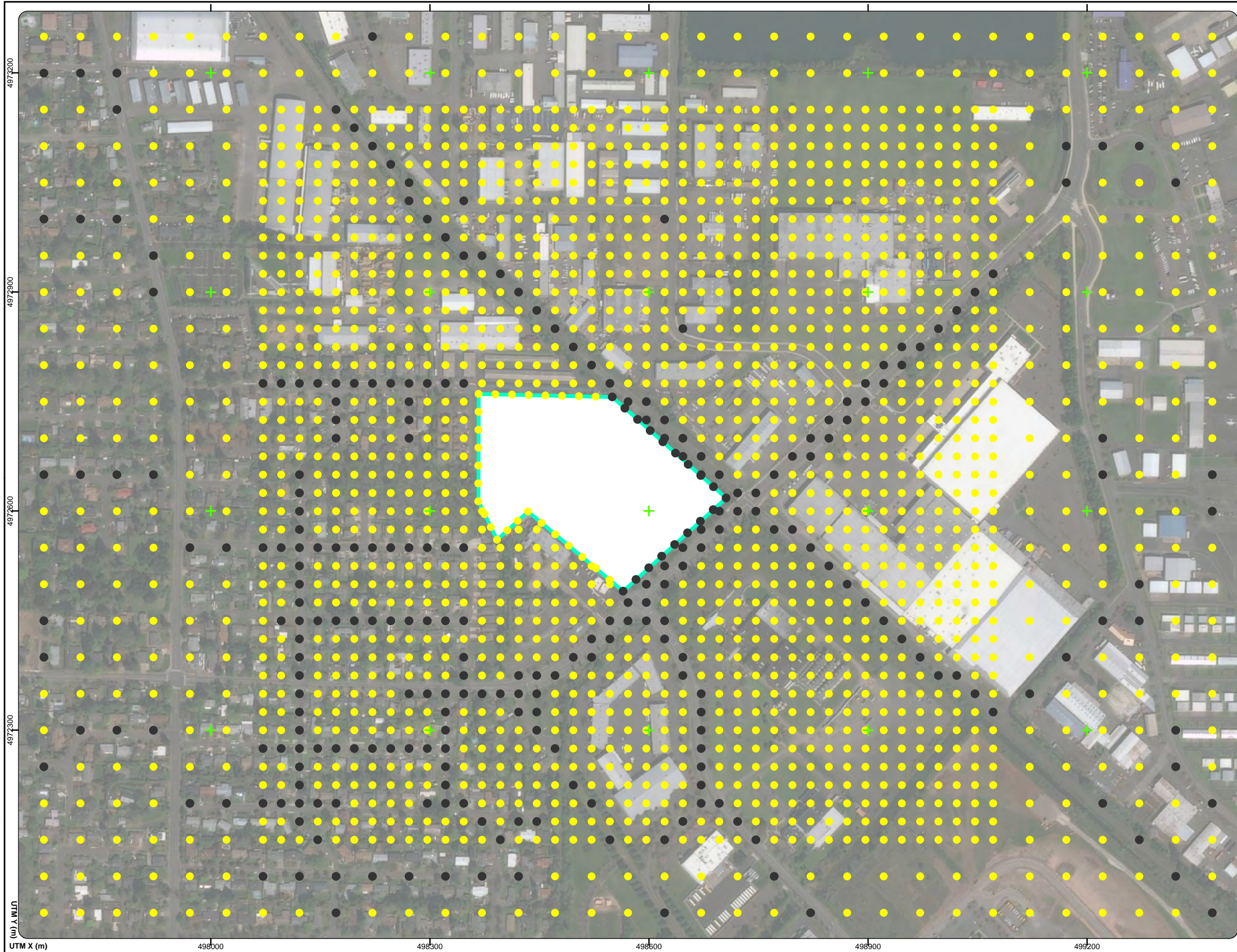
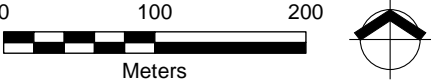


Figure 4-4  
Proposed Receptor  
Locations in the  
Immediate Area  
Packaging Corporation of America  
Salem, OR

- Legend
- UTM Grid Guideline
  - Proposed Receptor
  - Proposed Receptor in Road or Rail Right-of-Way
  - Property Boundary
  - Blanking Boundary



Sources: Aerial photograph obtained from Esri  
ArcGIS Online.



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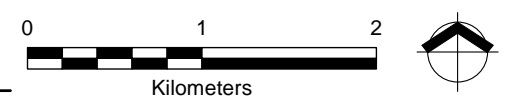


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Reviewed By: E. Bornhorst Print Date: 3/17/2021  
Produced By: aguse  
Project: 1831.01

Figure 5-1  
Existing Land-Use  
Zoning Classifications  
Packaging Corporation of America  
Salem, OR

- Oregon Statewide Zoning (2017)**
- No Data / Other
  - Commercial - Central
  - Commercial - General
  - Commercial - Neighborhood
  - Commercial - Office
  - Rural Commercial
  - Industrial - Heavy
  - Industrial - Light
  - Industrial Campus
  - Industrial Office
  - Rural Industrial
  - Rural Residential 1 acre; Rural Residential 10 acres; Rural Residential 2-4 acres; Rural Residential 5 acres
  - Very Low-density Res.
  - Low-density Res.
  - Medium Low-density Res.
  - Medium High-density Res.
  - Medium-density Res.
  - Very High-density Res.
  - Future Urban Development
  - Mixed-Use Com. & Res. Extremely High; Mixed-Use Com. & Res. High; Mixed-Use Com. & Res. Low; Mixed-Use Com. & Res. Med-high; Mixed-Use Com. & Res. Medium; Mixed-Use Com. & Res. V.High
  - Exclusive Farm Use
  - Mixed Farm-Forest 160+; Mixed Farm-Forest 20; Mixed Farm-Forest 40; Mixed Farm-Forest 80
  - Parks & Open Space
  - Public & Semi-public Uses

- Legend**
- UTM Grid Guideline
  - Property Boundary
  - City Limits (2018)
  - Proposed Modeling Domain Extents
  - Blanking Boundary



Sources: Aerial photograph obtained from Esri ArcGIS Online. Zoning data obtained from the Oregon Dept. of Land Conservation and Development.



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Reviewed By: E. Bornhorst Print Date: 3/17/2021  
Produced By: aguse  
Project: 1831.01

Figure 5-2  
Existing Land-Use  
Zoning Classifications in the  
Immediate Area  
Packaging Corporation of America  
Salem, OR

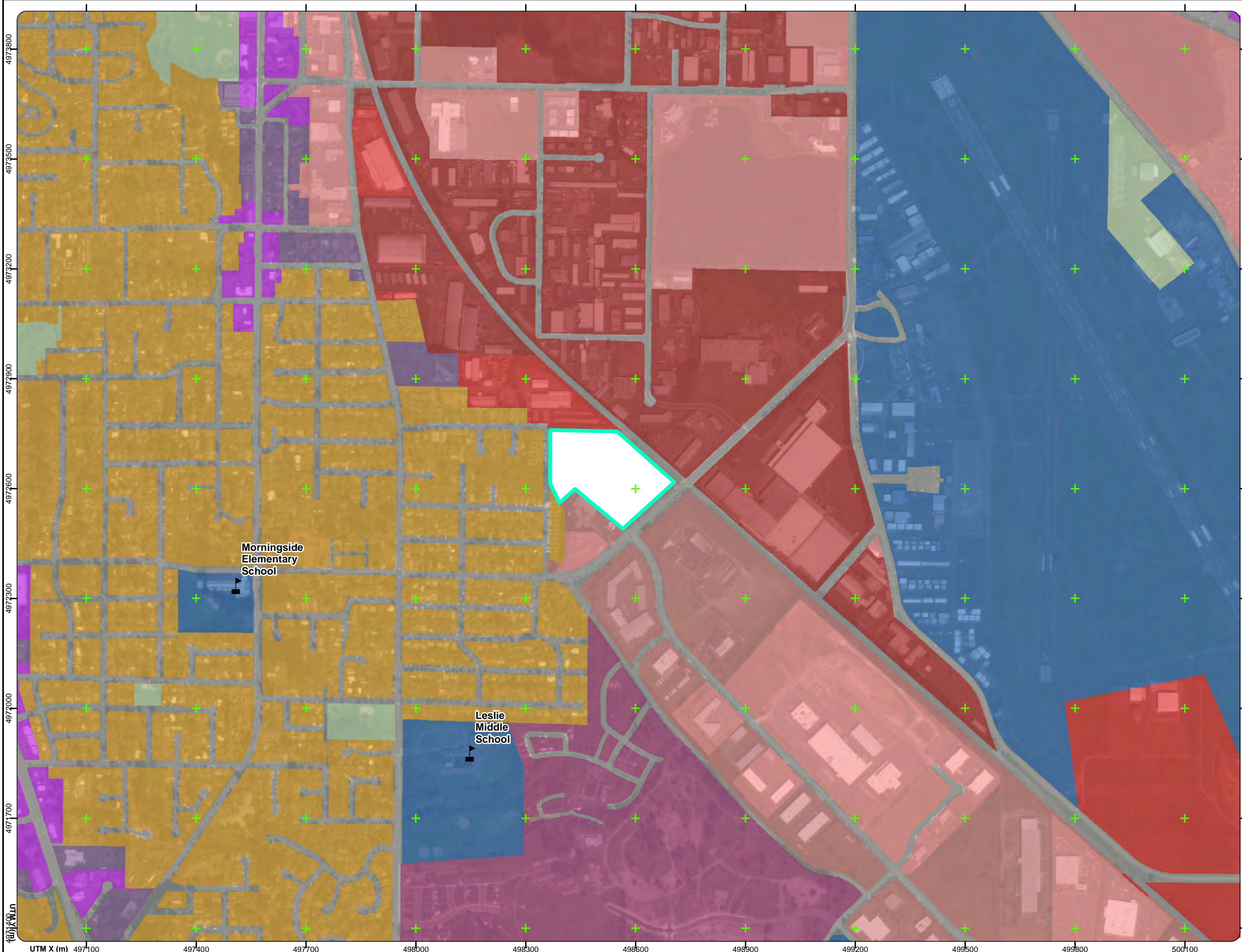
- Legend
- UTM Grid Guideline
  - Property Boundary
  - Blanking Boundary
- Oregon Statewide Zoning (2017)**
- Commercial - General
  - Commercial - Office
  - Rural Commercial
  - Industrial - Heavy
  - Industrial - Light
  - Industrial Campus
  - Industrial Office
  - Rural Industrial
  - Rural Residential 1 acre; Rural Residential 10 acres; Rural Residential 2-4 acres; Rural Residential 5 acres
  - Medium Low-density Res.
  - Medium High-density Res.
  - Future Urban Development
  - Mixed-Use Com. & Res.
  - Exclusive Farm Use
  - Mixed Farm-Forest 160+; Mixed Farm-Forest 20; Mixed Farm-Forest 40; Mixed Farm-Forest 80
  - Parks & Open Space
  - Public & Semi-public Uses



Sources: Aerial photograph obtained from Esri ArcGIS Online. Zoning data obtained from the Oregon Dept. of Land Conservation and Development.



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Reviewed By: E. Bornhorst    Print Date: 5/19/2021  
Produced By: aguse  
Project: 1831\_01

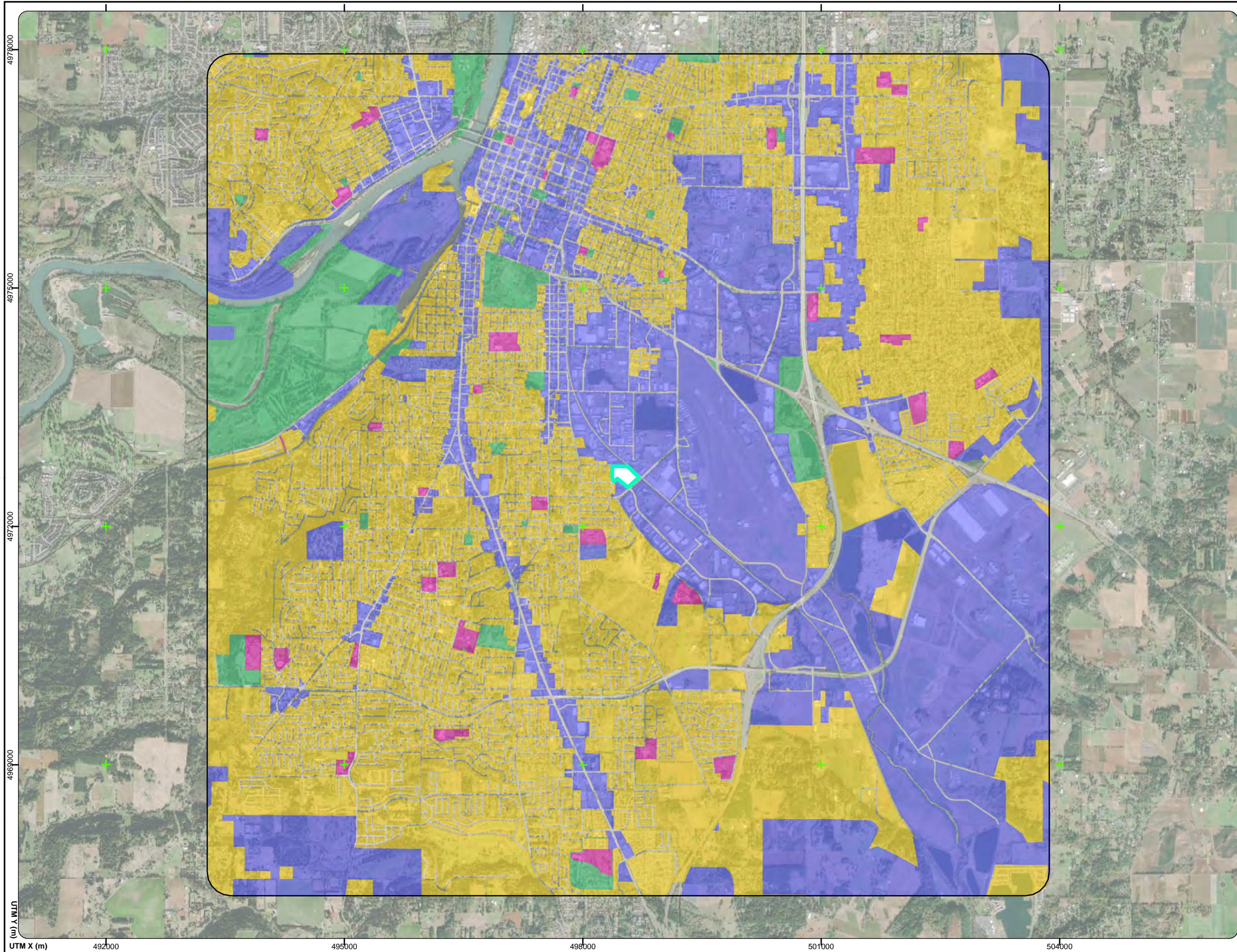


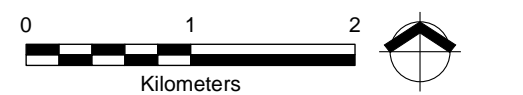
Figure 5-3  
Proposed Exposure  
Categorization  
Packaging Corporation of America  
Salem, OR

**Legend**

- UTM Grid Guideline
- Property Boundary
- Blanking Boundary
- Proposed Modeling Domain Extents

**Proposed Exposure Type Classification**

- Residential
- Child
- Worker
- Acute-only



Sources: Aerial photograph obtained from Esri ArcGIS Online.

1. Zoning data obtained from the Oregon Dept. of Land Conservation and Development.
2. Existing land use classifications revised to reflect one of the four risk-based concentration categories presented in Oregon Administrative Rule 340-245-8040 Table 4.
3. Non-taxlot land use areas (e.g., interstate right-of-way) will not be assessed for cancer or noncancer risk.

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Path: X:\1831\_01\_PackagingCorpOfAmerica\02GIS\Fig5-4\_Proposed\_Exposure\_Categorization\_Immediate.mxd  
Project: 1831.01  
Produced By: aguse  
Reviewed By: E. Bornhorst  
Print Date: 3/17/2021

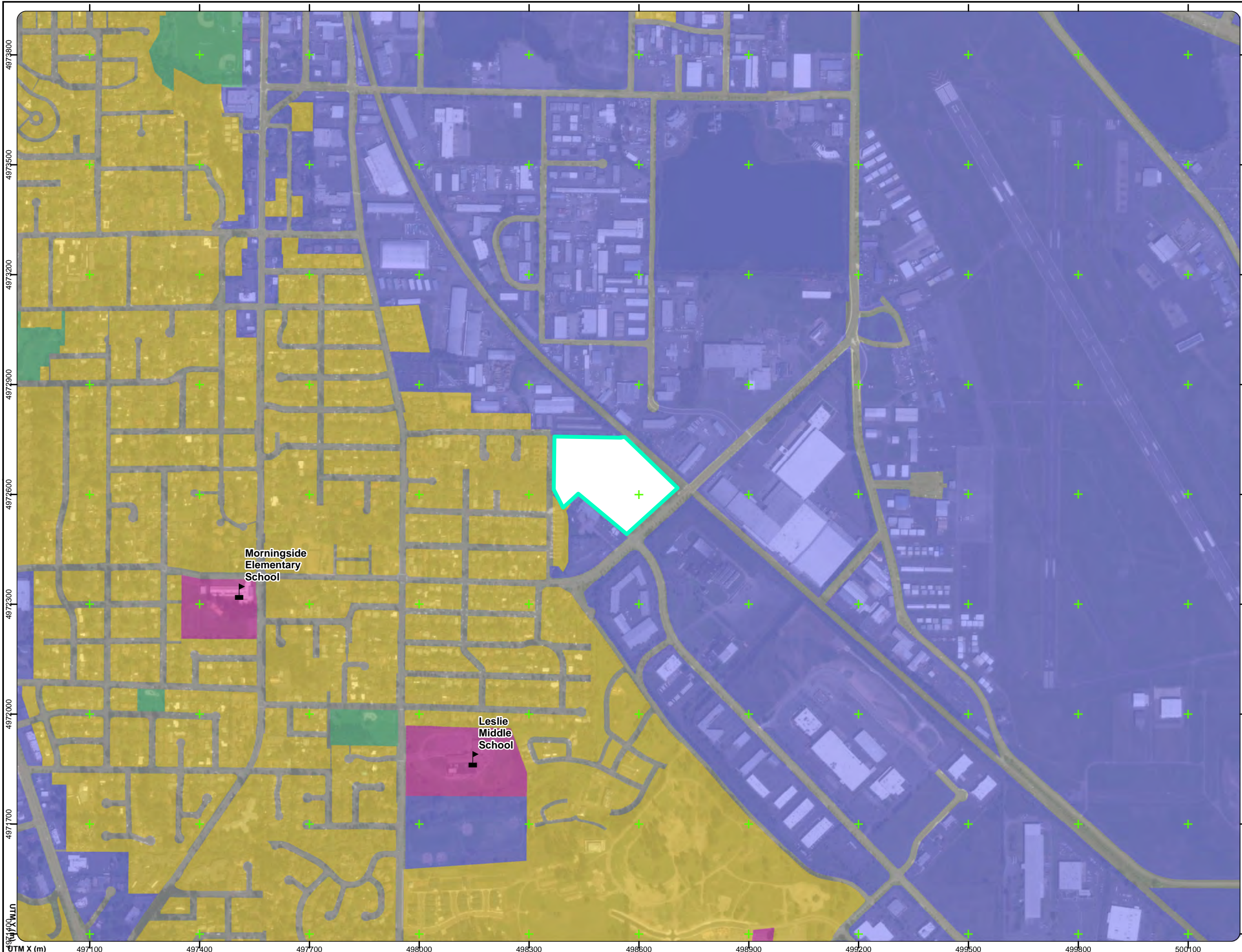


Figure 5-4  
Proposed Exposure  
Categorization in the  
Immediate Area  
Packaging Corporation of America  
Salem, OR

Legend

- UTM Grid Guideline
- School Location (2015-16)
- Property Boundary
- Blanking Boundary

**Proposed Exposure Type Classification**

- Residential
- Child
- Worker
- Acute-only

0 100 200  
Meters

Sources: Aerial photograph obtained from Esri  
ArcGIS Online.  
Zoning data obtained from the Oregon  
Dept. of Land Conservation and Development.  
Existing land use classifications  
revised to reflect one of the four risk-based  
concentration categories presented in  
Oregon Administrative Rule 340-245-8040  
Table 4.  
Non-taxlot land use areas (e.g., interstate  
right-of-way) will not be assessed for cancer  
or noncancer risk.

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