NAAQS MODELING REPORT
Kenmore Plant

Cadman Materials, Inc. / Kenmore, WA

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1. INTRODUCTION

Cadman Materials, Inc. (Cadman) operates an asphalt batch plant located at 6431 NE 175th Street, Kenmore, WA 98028 (the Kenmore plant). The plant has operated since the 1960s under various owners. Cadman purchased the plant in July 2017 from CEMEX. Equipment at the Kenmore plant has operated under three prior Orders of Approval (OACs) issued by the Puget Sound Clean Air Agency (PSCAA).

- OAC 939 (issued April 4, 1973): Installation of particulate emission controls (baghouse with cyclones) to control batch plant emissions;
- OAC 1938 (issued August 8, 1979): Installation of fume scavenging system to control emissions from flight conveyor and two storage silos; and
- OAC 3536 (issued June 14, 1990): Approved use of nuisance soils in raw materials of the asphalt batch plant.

Over many years, the Kenmore plant has made various changes to its aggregate dryer, including the following changes that have recently been the subject of discussions with PSCAA:

- Replacement of the existing 103 MMBtu/hr dryer burner with a new 100 MMBtu/hr burner in 2003
- Alterations to the existing dryer baghouse to accommodate longer bags (2006), to replace the exhaust fan (2007), and to replace the tube sheet and shorten the baghouse body (2016);
- Routing the scavenger duct from truck loading process to the dryer baghouse in 2009; and
- Replacement of the dryer shell and several internal stages in 2018.

In an August 17, 2020 email from Brian Renninger, PSCAA stated its opinion that because the primary emission creating components of the dryer (drum shell and burner) were replaced, it considers the dryer itself to be replaced and to have triggered New Source Review (i.e., the Notice of Construction (NOC) permitting process).

On June 16, 2021, PSCAA stated that AERMOD modeling is needed for criteria pollutants and should also be used for updated toxic air pollutant (TAP) modeling. The email from Brian Renninger (PSCAA) specified that modeling should be completed for the following criteria pollutants: particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), $PM_{2.5}$, nitrogen oxides (NO_X), and carbon monoxide (CO) because PSCAA's extrapolation of the TAP AERSCREEN results indicated these criteria pollutant screening concentrations could exceed their Significant Impact Levels (SILs). A SIL modeling analysis for the above pollutants is conducted using AERMOD. Because the SIL is exceeded for all pollutants, a National Ambient Air Quality Standard (NAAQS) modeling analysis is conducted.

Cadman submitted a modeling protocol to PSCAA on July 23, 2021, which described the methodology that is used for the SIL and NAAQS modeling. After email exchanges to agree on minor updates to receptor grids and stack location, Cadman received email approval of the protocol from Brian Renninger on August 5, 2021. Section 2 of this report contains the final modeling methodology approved by PSCAA. Cadman submitted the initial dispersion modeling report to PSCAA on August 27, 2021, with SIL model results. The August 2021 report described the methods and results to demonstrate compliance with the Acceptable Source Impact Levels (ASILs) under WAC 173-460 and for comparison to the SILs for PM_{10}, $PM_{2.5}$, NO_X, and CO. It also described the proposed methodologies that are used in this NAAQS report.

This report serves as Cadman's final dispersion modeling report to demonstrates compliance with the NAAQS. This modeling analysis also includes some updates to Cadman emissions and parameters, which are further discussed in Section 2.8.

2. MODELING METHODOLOGY

This section of the modeling protocol presents the procedures that are utilized to perform the air dispersion modeling analysis.

2.1 Model Selection

The latest version (21112) of the AERMOD model is used to estimate maximum ground-level concentrations in the air dispersion analysis. AERMOD is a refined, steady-state, multi-source, air dispersion model to be used for industrial sources.[1]

2.2 Meteorological Data

The modeling analysis is performed using five years of representative meteorological data (2011 to 2015) for the AERMOD dispersion model. The meteorological data is processed using the AERMET version 18081 with all regulatory default options. Data are obtained from the following sources:

- Surface meteorological data (wind speed, wind direction, temperature) correspond to readings from the meteorological station at the Paine Filed Airport (Station ID 24222).
- Upper air data correspond to the nearest upper air station, Quillayute State Airport (Station ID 94240).

The 1-min ASOS data is used wherever available. Note that the 2011 through 2015 dataset is proposed, because the National Weather Service (NWS) has identified a calibration error in wind data starting November 29, 2016 at 12 PM through 2 PM March 19, 2019. Trinity contacted the modeler with Washington State Department of Ecology (Ecology), Dr. Ranil Dhammapala, and confirmed that 2011 through 2015 would be the most appropriate years. This dataset was approved by PSCAA on August 5, 2021.

2.3 Coordinate System

The location of emission source, structures and receptors are represented in the Universal Transverse Mercator (UTM) coordinate system using the North American 1983, Continental U.S. projection. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). UTM coordinates for this analysis are based on UTM Zone 10. The location of the Kenmore plant is approximately 5,289,658 m Northing and 555,789 m Easting in UTM zone 10.

2.4 Terrain Elevations

Terrain elevations for receptors, buildings, and sources are determined using National Elevation Dataset (NED) supplied by the United States Geological Survey (USGS). The NED is a seamless dataset with the best available raster elevation data of the contiguous United States. NED data retrieved for this model have a grid spacing of 1/3 arc-second or 10 m. The AERMOD preprocessor, AERMAP version 18081, is used to compute model object elevations from the NED grid spacing. AERMAP also calculates hill height data for all receptors. All data obtained from the NED files are checked for completeness and spot-checked for accuracy.

[1] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).

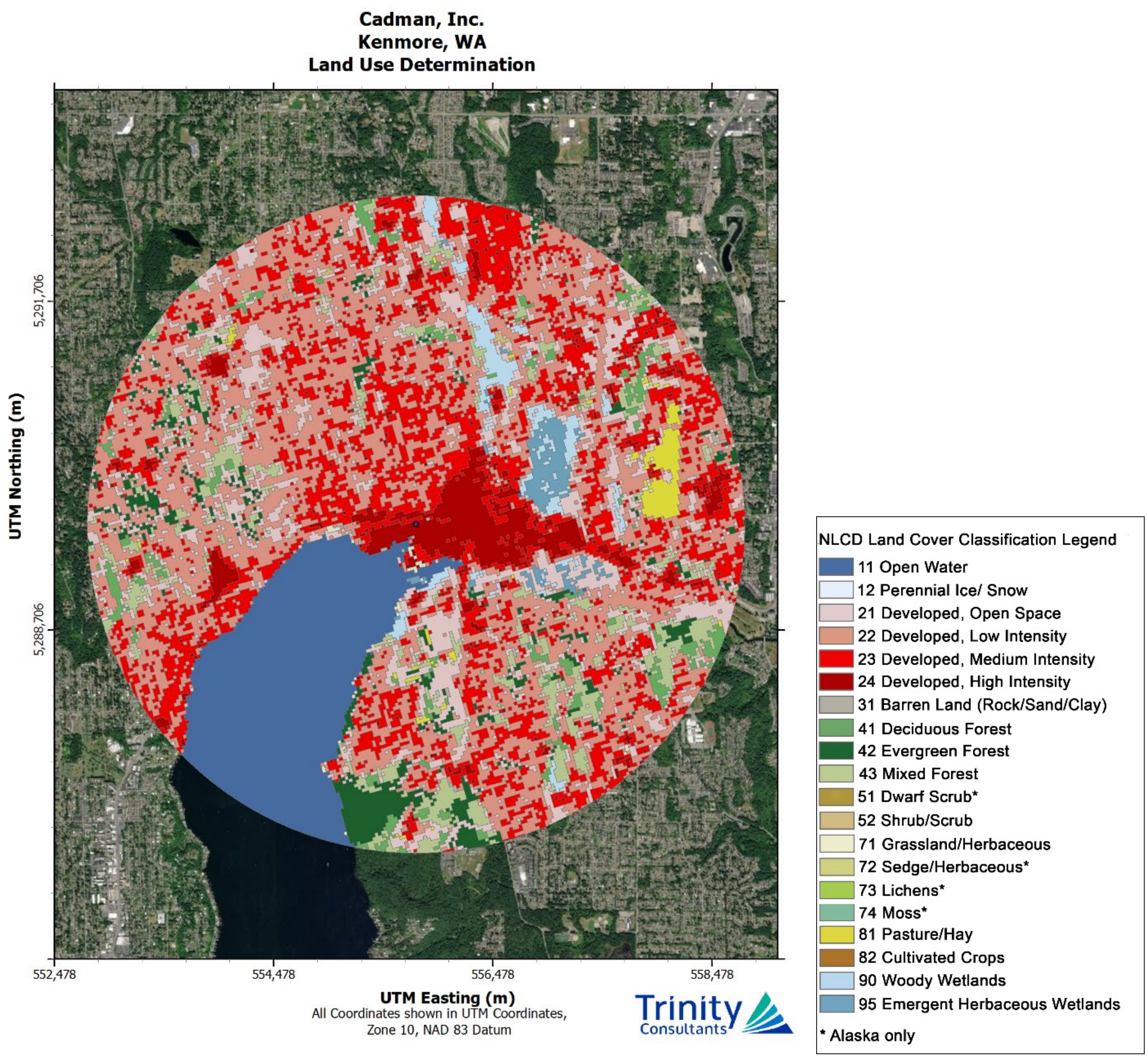
2.5 Urban/Rural Determination

The Multi-Resolution Land Characteristics Consortium National 2019 Land Cover Database (NLCD) was reviewed to determine whether the site location should be classified as urban or rural.

In accordance with 40 CFR Part 51 Appendix W, Section 7.2.1.1(b)(i), the land use is classified based on a 3-kilometer radius circle around the facility center. Developed, high intensity and developed, medium intensity areas are considered urban, and all other areas are considered rural.

The NLCD2019 data map demonstrates that 26% of the land use within a 3-kilometer radius of the facility is considered urban (i.e., 26% of the land is classified as either *developed, high intensity* or *developed, medium intensity*) as shown in Figure 2-1 below. Therefore, since less than 50% of the land use is urban, AERMOD's urban option is not selected.

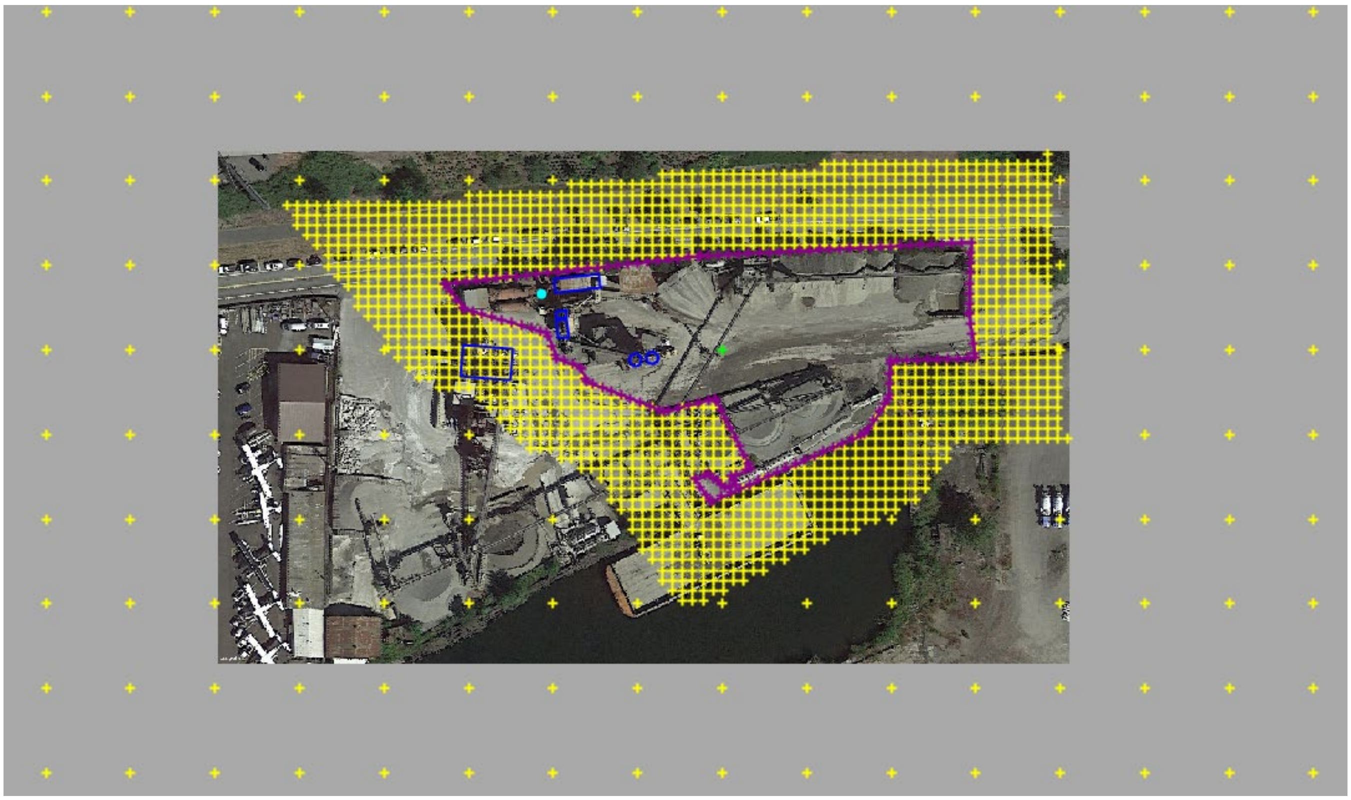
Figure 2-1. Urban/Rural Determination



2.6 Receptor Grids

Since the highest air concentrations from the main emission source (the dryer) are close to the property boundary, a circular Cartesian receptor grid with 3-meter spacing extending 25 meters from the fenceline, as well as 25-meter spacing extending 2,000 meters and on the facility's property boundary (fence line boundary), is used for the dispersion modeling analysis as shown in Figure 2-2 below. The Kenmore plant is shown below in Figure 2-3 with the fenceline represented by the solid white outline surrounding the yellow highlighted area.[2] Additionally, a medium grid with 250-meter spaced receptors extending 5,000 meters from the center of the facility is also included.

Figure 2-2. Receptor Grid



[2] The fenceline is established to align with Cadman's lease boundary, which also includes a physcial fence on the northern boundary along NE 176th Street. A travel pathway between the two Cadman equipment areas is owned by CalPortland; however, Cadman's Lease Agreement allows use of the pathway for truck traffic. Gates are located at facility access points and are closed when the site is not operating.

Figure 2-3. Facility Fenceline

Table 2-1 below are also included.

Table 2-1. Sensitive Receptors

Location	UTM Easting (m)	UTM Northing (m)
Lakeside School Boathouse	556,260.68	5,289,435.17
Kenmore Library	556,036.73	5,289,824.08
Lakeforest Park Cooperative Preschool	555,402.49	5,289,839.82
Kenmore Elementary	556,508.24	5,290,739.88
Log Boom Park	555,116.54	5,289,605.05
Rhododendron Park	556,331.01	5,289,129.96
Kenmore Town Square	556,195.21	5,289,874.64
Bethany Bible Church	555,502.06	5,289,758.64
Church of the Redeemer	555,489.23	5,289,830.94
Northlake Lutheran Church	556,081.58	5,290,281.53
Cedar Park Northshore Assembly of God	556,209.24	5,290,495.83

2.7 Building Downwash

Emissions from sources are evaluated in terms of proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures. Wind blowing around a building creates zones of turbulence that are greater than if the buildings were absent. The concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents are applied. Model building parameters can be found in Appendix A.

2.8 Source Emissions and Parameters

Emissions from the dryer are represented in the model as a point source and are refined as a part of this modeling effort. A stack test was performed on the aggregate dryer on October 1, 2020. Results from the stack test can be found in Appendix B. The filterable and condensable PM exhaust concentrations are used to calculate the PM_{10} and $PM_{2.5}$ emission rates. A safety factor of 1.3 is applied to each of the exhaust concentrations. Detailed emission calculations can be found in Appendix A. Additionally, the exhaust flow rate, temperature, and oxygen percentage are used to calculate the emission rates of NO_X and CO. Updated stack parameters based on the stack test are summarized in Table 2-2 below.

Table 2-2. Model Source Parameters

Source	X Coordinate [a] (m)	Y Coordinate [a] (m)	Elevation (m)	Stack Height (m)	Stack Temperature [b] (k)	Stack Velocity [b] (m/s)	Stack Diameter (m)
Dryer Stack	555,760.8	5,289,682.2	9.38	5.49	361	16.94	1.02

[a] The location of the dryer stack was adjusted slightly as compared to the original protocol based on the protocol response from Brian Renninger (PSCAA).
[b] The dryer stack temperature and velocity are updated compared to the original protocol based on the source-specific stack test data.

As stated in Section 4.1, the SIL model results exceed the SIL for all pollutants. Therefore, a NAAQS modeling analysis was performed including other Cadman sources and nearby sources at the adjacent CalPortland facility. Additional model source parameters, including additional Cadman sources and CalPortland sources, can be found in Appendix A.

3. TAP MODELING ANALYSIS

Dispersion modeling is conducted to demonstrate compliance with the Washington TAP program in WAC 173-460. WAC 173-460 established a Small Quantity Emission Rate (SQER) and ASIL for each listed TAP. An *acceptable source impact analysis* must be conducted for each TAP with an emission increase. The toxics rule, in WAC 173-460-080(2) allows for applicants to satisfy the acceptable source impact limit if emissions are below the SQER for each TAP. The emission increase of chromium (VI) is above the respective SQER; therefore, dispersion modeling is required.

All modeled TAPs must be below the respective ASIL listed in WAC 1703-460-150 in order to demonstrate compliance. Chromium (VI) is modeled at 1 gram per second (g/s) and scaled using the project emission increase per WAC 173-460-080. The model results are determined based on the maximum concentration increase across all receptors and model years. Results in Table 3-1 below show that the maximum chromium (VI) concentration is below the ASIL and therefore demonstrates compliance. No change to the TAP modeling analysis since the August 2021 report.

Table 3-1. TAP Model Results

Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	ASIL ($\mu g/m^3$)	Exceeds ASIL?
Chromium (VI)	Annual	1.01E-07	4.00E-06	No

4. SIL AND NAAQS MODELING ANALYSIS

Dispersion modeling is conducted to determine whether increases in PM_{10}, $PM_{2.5}$, NO_2, and CO from the project are insignificant or significant (below or above the SIL). The SIL model concentrations exceed the SIL for all given pollutants. Therefore, dispersion modeling is conducted to demonstrate compliance with NAAQS. Table 4-1 below shows the applicable SIL and NAAQS.

Table 4-1. SIL and NAAQS Standards

Pollutant	Averaging Period	SILs (µg/m^3)	NAAQS (µg/m^3)	Modeled Design Value Used
PM_{10}	24-hour	5	150	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	Annual	0.3	12	Annual arithmetic mean from single or multiple monitors, averaged over 3 years
	24-hour	12	35	98th percentile of concentrations in a given year, averages over 3 years
NO_2	Annual	1	100	Annual arithmetic mean
	1-hour	7.5 [a]	188	3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations
CO	8-hour	500	10,000	Not to be exceeded more than once per calendar year
	1-hour	2,000	40,000	Not to be exceeded more than once per calendar year

a. A Significant Impact Level for the NO_2 1-hour NAAQS has not yet been proposed. However, an interim level was provided by EPA in a general guidance implementation memo on June 28, 2010.

4.1 SIL Modeling

For the SIL analysis, each given pollutant is compared to the SIL in Table 4-1 using the modeled design value. The post-project emission rates from the dryer stack for each pollutant are calculated using results from the stack test conducted October 1, 2020, which can be found in Appendix B. These emission rates from the dryer stack are used in each respective SIL model. The increase in concentrations due to the post-project dryer emissions and due to the project emission increase[3] are both compared to the SIL.

Impacts from nearby and other sources, including background concentration, are not considered in the SIL analysis. PM_{10}, $PM_{2.5}$, and NO_2 1-hour models are all run with 5 year compiled meteorological data and the appropriate design value is calculated in AERMOD. Separate NO_2 annual and CO models are run for each individual meteorological year and the maximum results are compared to the respective SIL.

[3] The post-project model results are scaled using the pre- and post-project throughput to obtain the project increase model concentration. The project does not cause an increase in emissions for short-term averaging periods and results in small increases to annual emissions.

The NO_2 models are run using the ozone limiting method (OLM) to model the conversion of nitrogen oxide (NO) to NO_2. The ozone background concentration of 42.55 parts per billion (ppb) is obtained from NW Airquest[4]; the maximum concentration of the four closest grid points surrounding the facility is used for conservatism. An in-stack ratio (ISR) of 0.1 is used based on natural gas fired process units data from the EPA ISR database[5].

Table 4-2 below shows the results of the SIL models.

Table 4-2. SIL Model Results

Pollutant	Averaging Period	Design Concentration	Model Concentrations (µg/m³)		Class II SIL (µg/m³)	Exceeds SIL?	
			Post-Project	Project Increase		Post-Project	Project Increase
PM_{10}	24-hr	H1H	29.4	NA	5	Yes	NA
$PM_{2.5}$	Annual	--	1.33	0.15	0.3	Yes	No
	24-hr	H1H	19.23	NA	1.2	Yes	NA
NO_2	Annual	--	2.91	0.38	1	Yes	No
	1-hr	H1H	91.06	NA	7.5	Yes	NA
CO	8-hr	H1H	519.7	NA	500	Yes	NA
	1-hr	H1H	1,935.5	NA	2,000	No	NA

The increase in ambient concentrations from the project are below the SIL for all pollutants. However, all modeled criteria pollutants exceed the SIL when comparing the post-project emission levels; therefore, NAAQS modeling is conducted for all pollutants.

4.2 NAAQS Modeling

In a cumulative NAAQS analysis, the scope of the analysis is expanded from the significant impact analysis to include impacts from all other sources at the facility (including asphalt tanks and fugitive emissions), nearby sources, and background concentrations. Detailed emission calculations and modeling parameters for the asphalt tanks and fugitive emission sources for the Kenmore plant can be found in Appendix A and Appendix C, respectively. The facility operates up to 13 hours per day (hours/day). The AERMOD emission factor function is appropriately applied to the Cadman sources on an hourly basis to represent daily operations at 13 hours/day.

Background concentrations in Table 4-3 are obtained from NW Airquest. For each pollutant and averaging period, the maximum concentration of the four closest grid points surrounding the facility is used for conservatism.

[4] NW Airquest is housed through Idaho Department of Environmental Quality. It provides ozone and criteria pollutant background concentrations through model and monitoring data from July 2014 through June 2017. https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe

[5] U.S. EPA Support Center for Regulatory Atmospheric Modeling (SCRAM), "NO2/NOX In-Stack Ratio (ISR) Database." https://www.epa.gov/sites/production/files/2020-11/no2_isr_database.xlsx. The mean ISR for natural gas boilers, furnaces, and other natural gas combustion is 0.036, and the maximum value is 0.072, so a value 0.1 is selected as a conservative upper bound ISR value.

Table 4-3. Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
PM_{10}	24-hr	39.9
$PM_{2.5}$	Annual	6.8
	24-hr	21.2
NO_2	Annual	26.7
	1-hr	92.7
CO	8-hr	1,523.1
	1-hr	2,427.8

Nearby facilities emissions are also required to be included in the NAAQS analysis. Based on a review of nearby facilities, the adjacent CalPortland facility is the only nearby source that could cause a significant concentration gradient in the vicinity of the Kenmore plant (and therefore may not be adequately characterized by the background concentrations based on monitoring data).[6] The CalPortland facility is explicitly modeled in the NAAQS analysis using emission data from NOC worksheets provided by PSCAA (Brian Renninger on August 30, 2021). It is assumed that the facility operates for 12 hours/day, and the AERMOD emission factor function is also applied to the CalPortland sources. Model parameters for the CalPortland facility can be found in Appendix A.

Table 4-4. NAAQS Model Results

Pollutant	Averaging Period	Design Concentration	Concentrations ($\mu g/m^3$)			Exceeds NAAQS?
			Modeled	Total	NAAQS	
PM_{10}	24-hr	H6H	90.0	129.9	150	No
$PM_{2.5}$	Annual	--	1.7	8.5	12	No
	24-hr	H8H	12.5	33.7	35	No
NO_2	Annual	--	2.9	29.6	100	No
	1-hr	H8H	91.1	183.7	188	No
CO	8-hr	H2H	519.7	2,042.8	10,000	No
	1-hr	H2H	1,935.5	4,363.3	40,000	No

The modeled post-project emission concentrations for criteria pollutants are below the NAAQS. Therefore, compliance with the NAAQS for the Kenmore plant is demonstrated. The mapped NAAQS results are included in Appendix B and show points of community interest that are identified by PSCAA as sensitive receptors and listed in Table 2-1.

[6] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Section 8.3.3 .

APPENDIX A. MODEL PRAMETERS

Appendix Table A-1. Cadman Rectangular Building Parameters

Building	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)	X Length (m)	Y Length (m)
Baghouse	555,764.5	5,289,686.9	9.9	7.9248	4.0	13.4
Batch tower	555,765.1	5,289,674.8	8.41	12.192	5.5	3.2
Hotstone elevator	555,765.1	5,289,677.1	8.7	14.3256	2.1	2.9

a. Building elevations determined using AERMAP.
b. Building heights are obtained from Cadman via email on April 9, 2021. Other building dimensions estimated using Google Earth.

Appendix Table A-2. Cadman Circular Building Parameters

Building	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)	Radius (m)
Silo 1	555,793.5	5,289,663.5	7.02	19.812	1.794
Silo 2	555,788.5	5,289,662.9	6.96	19.812	1.794

a. Building elevations determined using AERMAP.
b. Building heights are obtained from Cadman via email on April 9, 2021. Other building dimensions estimated using Google Earth.

Appendix Table A-3. CalPortland Building Parameters

Building	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)	X Length (m)	Y Length (m)
Silos and building	555,737.5	5,289,667.4	7.78	20.4	9.2	14.8

a. Building elevations determined using AERMAP.
b. Building heights and dimensions estimated using Google Earth.

Appendix Table A-4. Cadman Fugitive Source Parameters

Source	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Release Height (m)	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)
Storage pile transfer - 1	555,824.50	5,289,644.00	6.51	3.35	4.026	3.119
Storage pile transfer - 2	555,840.10	5,289,651.00	7.13	3.35	4.026	3.119
Storage pile transfer - 3	555,834.20	5,289,688.40	10.11	3.43	2.867	3.191
Storage pile transfer - 4	555,842.80	5,289,688.40	10.2	3.43	2.867	3.191
Storage pile transfer - 5	555,850.70	5,289,688.40	10.2	3.43	2.867	3.191
Storage pile transfer - 6	555,859.90	5,289,688.80	10.15	3.43	2.867	3.191
Storage pile transfer - 7	555,870.70	5,289,689.40	10.03	3.43	2.867	3.191
Storage pile transfer - 8	555,880.20	5,289,689.60	9.85	3.43	2.867	3.191
Asphalt tanks	555,752.00	5,289,681.60	9.37	1.52	1.702	1.418
Silo Loadout 2	555,793.70	5,289,663.50	7.02	9.91	0.834	9.215
Batch Mix Loadout	555,767.00	5,289,672.40	8.1	6.10	0.744	5.671
Silo Loadout 1	555,788.60	5,289,662.90	6.96	9.91	0.834	9.215
Haul road truck 1	555,882.10	5,289,672.20	8.47	2.42	3.984	2.249
Haul road truck 2	555,873.60	5,289,671.30	8.57	2.42	3.984	2.249
Haul road truck 3	555,865.10	5,289,670.40	8.63	2.42	3.984	2.249
Haul road truck 4	555,856.60	5,289,669.50	8.68	2.42	3.984	2.249
Haul road truck 5	555,848.10	5,289,668.60	8.59	2.42	3.984	2.249
Haul road truck 6	555,839.50	5,289,667.70	8.39	2.42	3.984	2.249
Haul road truck 7	555,831.00	5,289,666.80	8.14	2.42	3.984	2.249
Haul road truck 8	555,822.70	5,289,665.30	7.8	2.42	3.984	2.249
Haul road truck 9	555,815.20	5,289,661.10	7.27	2.42	3.984	2.249
Haul road truck 10	555,807.60	5,289,657.20	6.93	2.42	3.984	2.249
Haul road truck 11	555,799.20	5,289,655.60	6.74	2.42	3.984	2.249
Haul road truck 12	555,790.80	5,289,653.90	6.63	2.42	3.984	2.249
Storage pile wind erosion - 1	555,824.50	5,289,644.00	6.51	3.35	4.026	3.119
Storage pile wind erosion - 2	555,840.10	5,289,651.00	7.13	3.35	4.026	3.119
Storage pile wind erosion - 3	555,834.20	5,289,688.40	10.11	3.43	2.867	3.191
Storage pile wind erosion - 4	555,842.80	5,289,688.40	10.2	3.43	2.867	3.191
Storage pile wind erosion - 5	555,850.70	5,289,688.40	10.2	3.43	2.867	3.191
Storage pile wind erosion - 6	555,859.90	5,289,688.80	10.15	3.43	2.867	3.191
Storage pile wind erosion - 7	555,870.70	5,289,689.40	10.03	3.43	2.867	3.191
Storage pile wind erosion - 8	555,880.20	5,289,689.60	9.85	3.43	2.867	3.191

a. Initial lateral and vertical dimensions were determined according to Table 3-2, AERMOD Users' Guide. All sources are considered surface-based. Haul road volume source parameters are determined according to the EPA memo Haul Road Workgroup Final Report Submission to EPA-OAQPS, dated March 2, 2012. The emissions associated with loadout occur at the bottom of the building structures (pugmill and silos), which create a cavity zone. Therefore, the loadout volume sources are modeled based on the dimensions of the building structures where the loadout occurs.

Appendix Table A-5. CalPortland Source Parameters

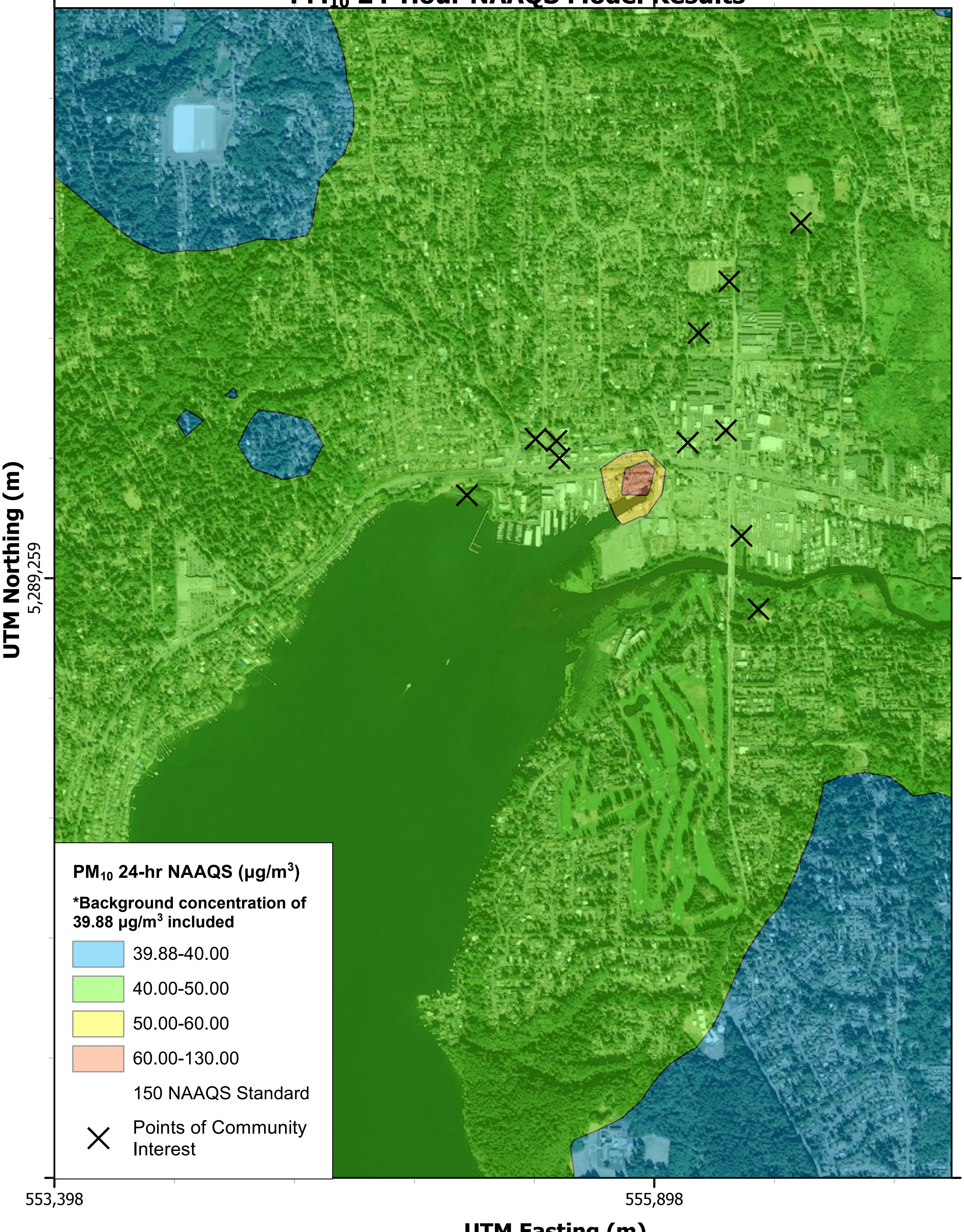
Source	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Release Height [a] (m)	Stack Temperature (k)	Stack Velocity (m/s)	Stack Diameter (m)
Silo 1 Baghouse	555,745.0	5,289,665.3	7.55	22.25	0	10.00	2.23
Silo 2 Baghouse	555,749.7	5,289,664.9	7.48	22.25	0	10.00	2.23
Silo 3 Baghouse	555,739.7	5,289,665.7	7.61	22.25	0	10.00	2.23
Loadout Baghouse	555,746.9	5,289,660.9	7.21	9.59	0	10.00	3.99
Sock Filter	555,741.3	5,289,661.1	7.19	9.59	0	0.001	0.01

a. Release height of silo baghouses are the height of the CalPortland silos plus the total height of the baghouse (6 feet) based on manufacturer specification.

b. Stack velocity for the baghouses is conservatively assumed to be 10.00 m/s. The flowrate and velocity are used to calculate the stack diameter for each baghouse.

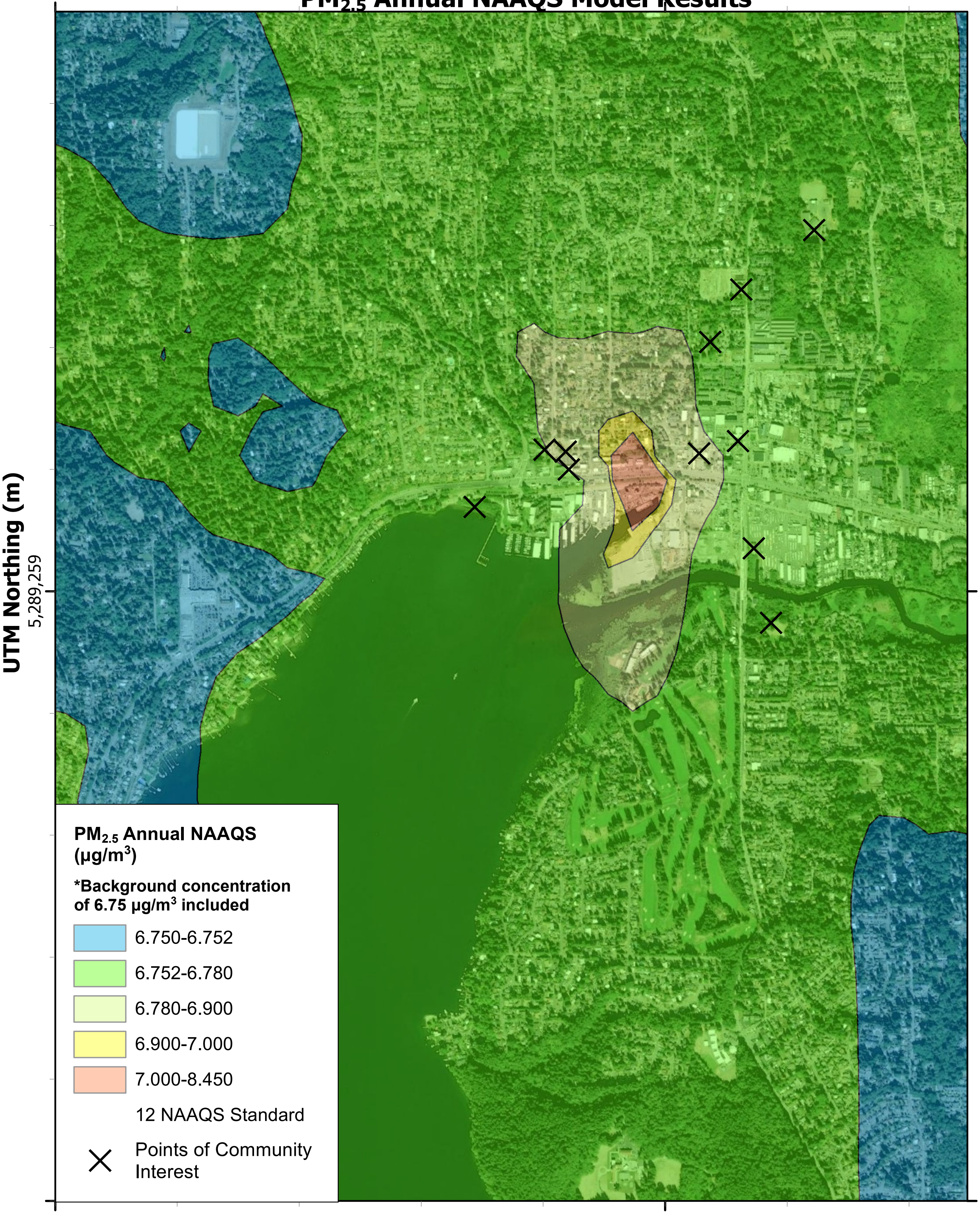
APPENDIX B. NAAQS MODEL RESULTS MAPS

Cadman Kenmore, WA
PM_{10} 24-Hour NAAQS Model Results



* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

Cadman Kenmore, WA
$PM_{2.5}$ Annual NAAQS Model Results



UTM Easting (m)
All Coordinates shown in UTM Coordinates, Zone 10, NAD 83 Datum

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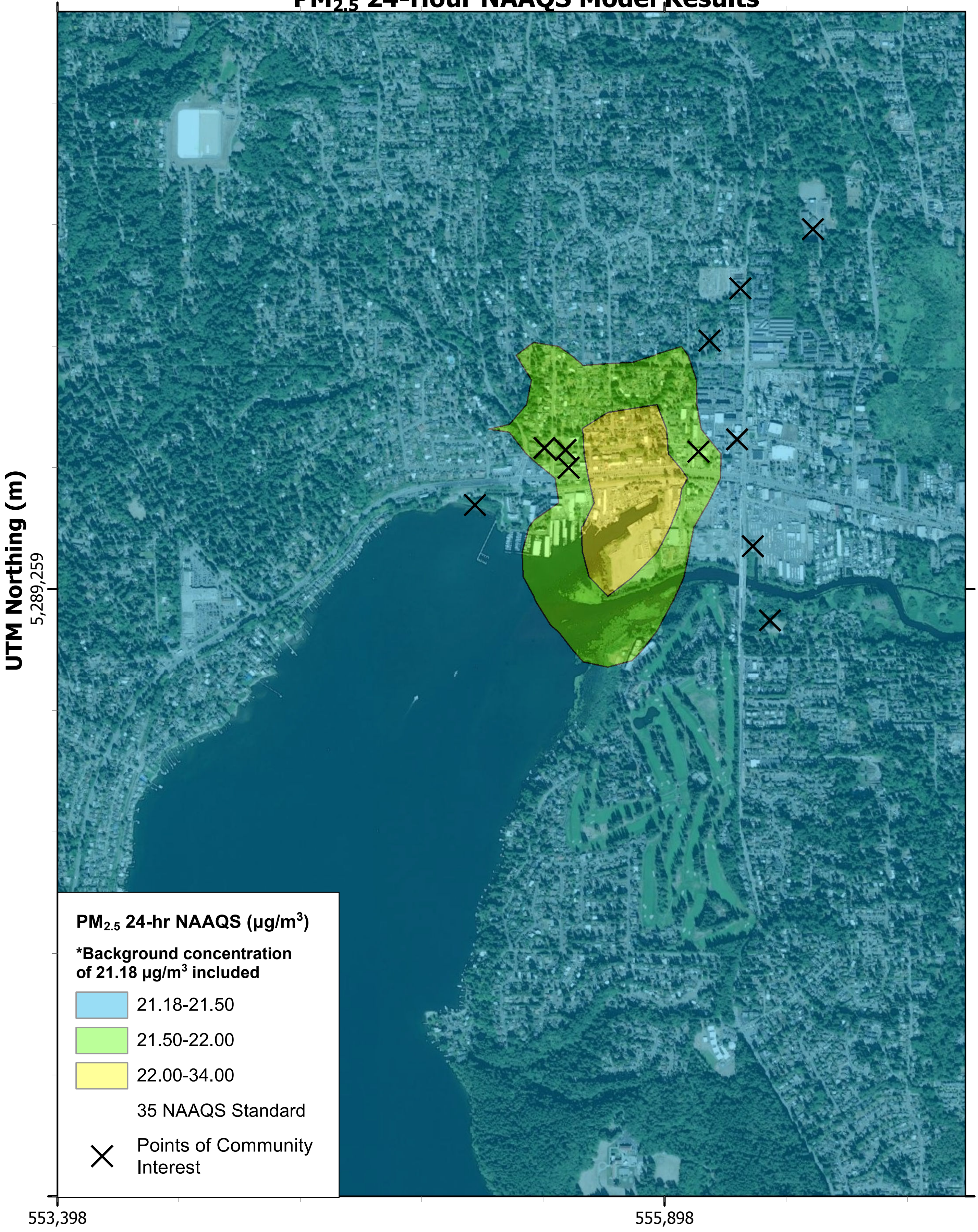
* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

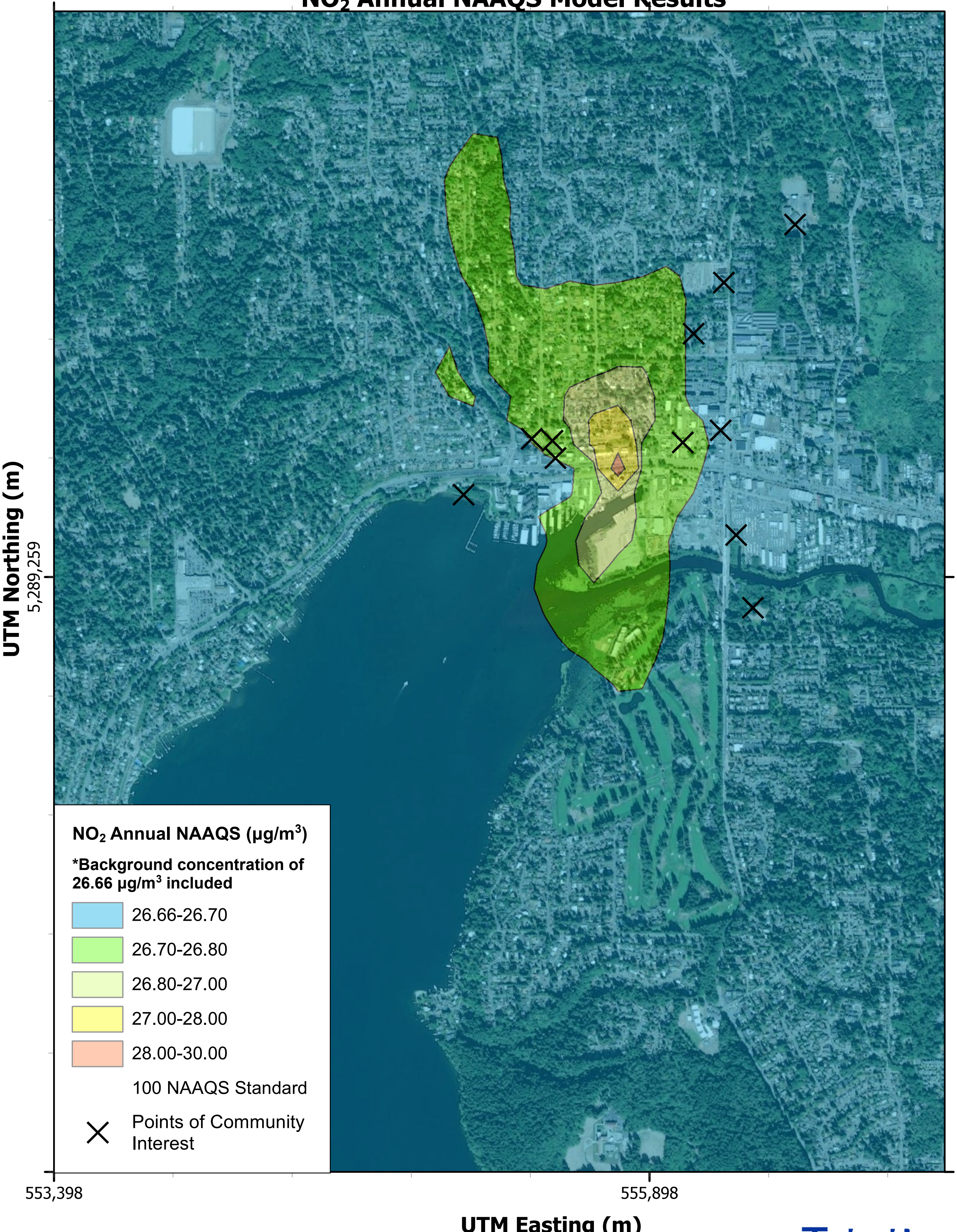
Cadman Kenmore, WA
PM$_{2.5}$ 24-Hour NAAQS Model Results



Trinity Consultants

* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

Cadman Kenmore, WA
NO_2 Annual NAAQS Model Results

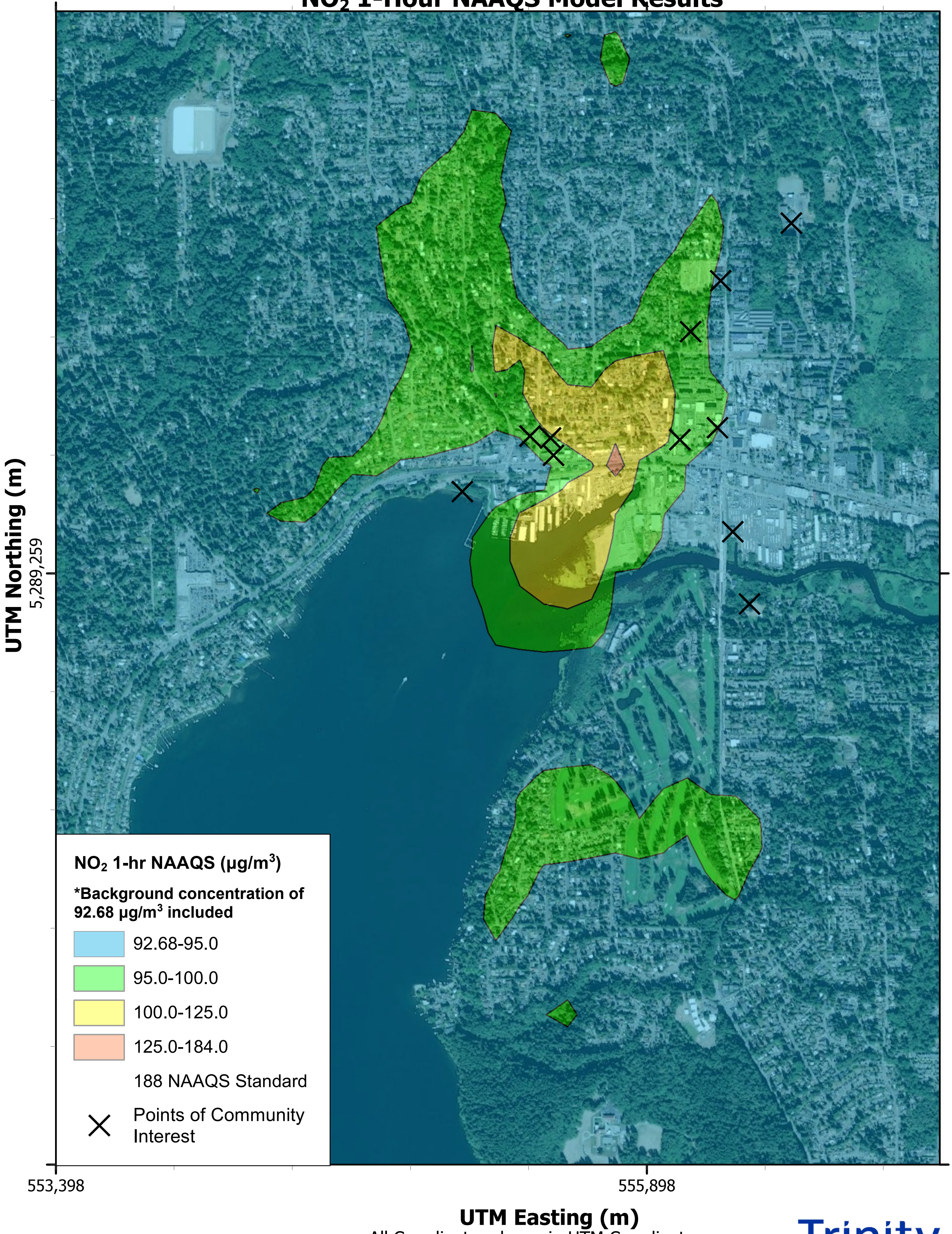


All Coordinates shown in UTM Coordinates,
Zone 10, NAD 83 Datum

Trinity Consultants

* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

Cadman Kenmore, WA
NO_2 1-Hour NAAQS Model Results

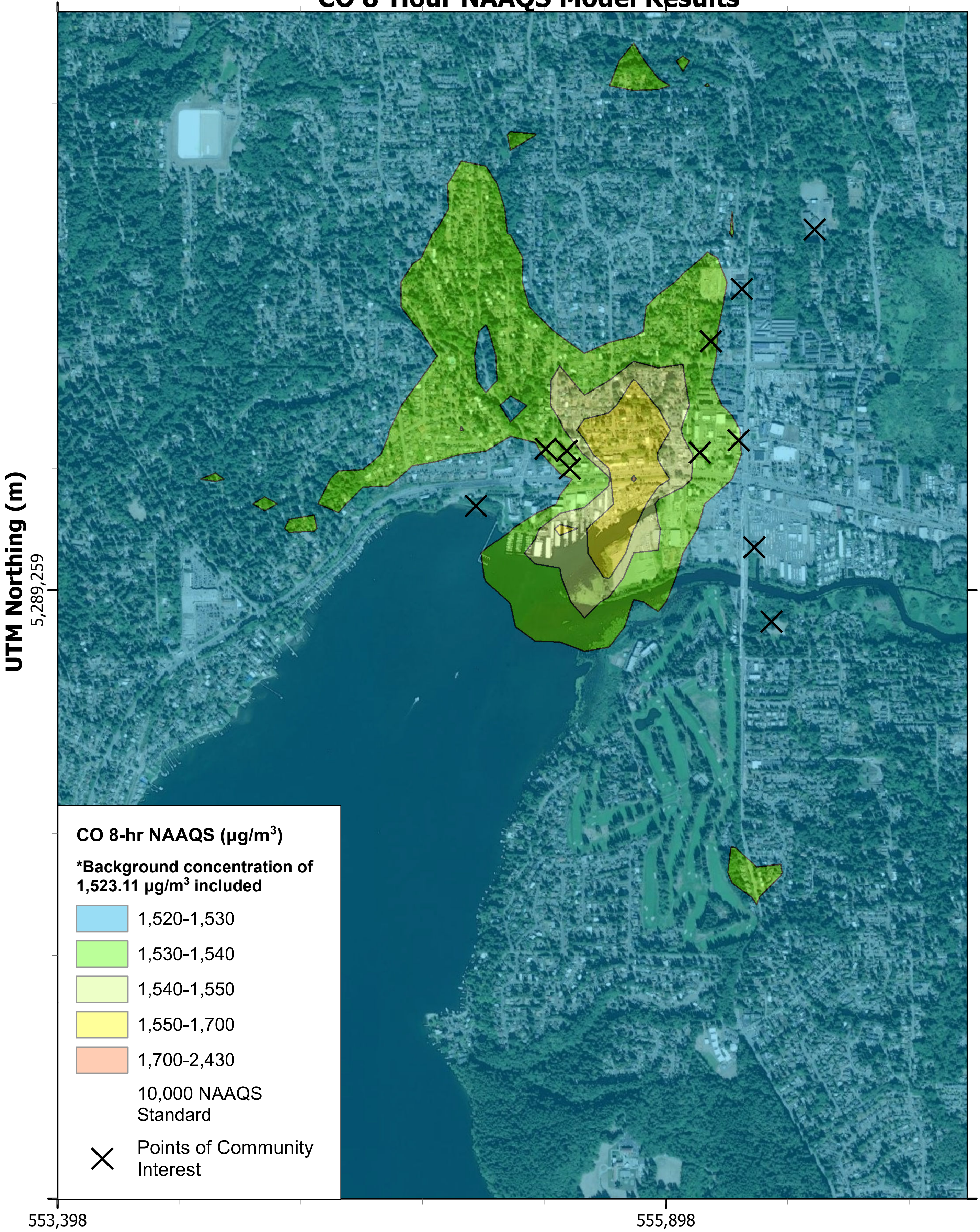


All Coordinates shown in UTM Coordinates, Zone 10, NAD 83 Datum

Trinity Consultants

* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

Cadman Kenmore, WA
CO 8-Hour NAAQS Model Results

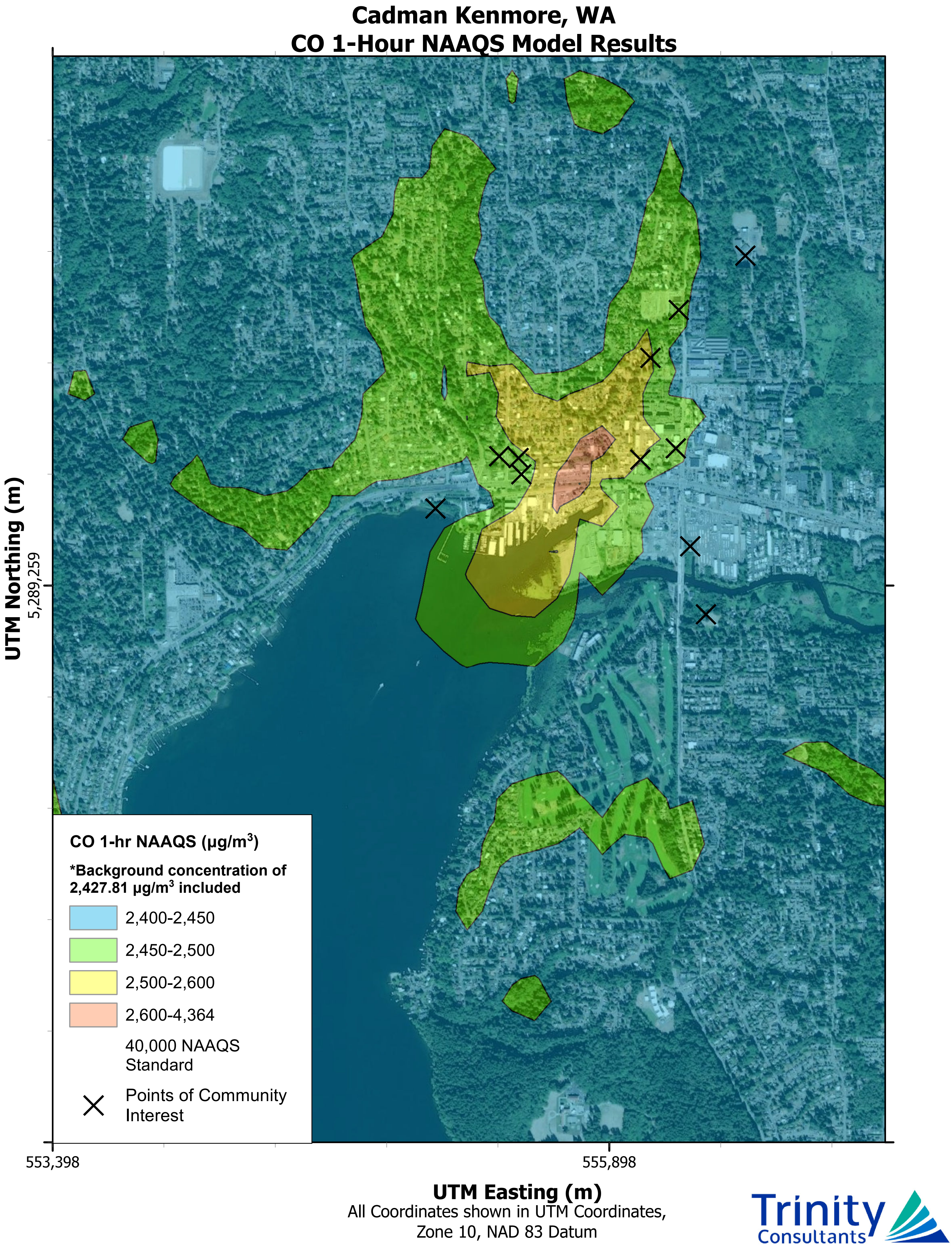


UTM Easting (m)

All Coordinates shown in UTM Coordinates, Zone 10, NAD 83 Datum

Trinity Consultants

* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors



* Points of Community Interest, as defined by PSCAA, are found in Table 2-1. Sensitive Receptors

APPENDIX C. STACK TEST REPORT

Cadman Materials Inc.
Cadman Kenmore
Hot Mix Asphalt Plant

Performance Tests for
Particulate Matter, Opacity,
Nitrogen Oxides and Carbon Monoxide

Test Date: **October 1, 2020**
Report Number: **3128-20**

Prepared for:

Cairncross & Hempelmann
524 2nd Ave., Suite 500
Seattle, WA 98104

Prepared by:

Emission Technologies, Inc.
5090 Samish Way
Bellingham, WA 98229

Report Certification

The emission testing for this report was carried out under my direction and supervision. In addition, I have reviewed all analysis and test results, and certify that the test and report meet EPA requirements and that, to the best of my knowledge, this test report is authentic and accurate.

Date: October 9, 2020 Signed: ______________________

Project Manager,

Rob Wilson

I have reviewed all analysis and test results, and certify that, to the best of my knowledge, this test report is authentic and accurate.

Date: October 9, 2020 Signed: ______________________

Quality Assurance Manager,

Danny Dizon P.E.

Reproducing portions of this test report may omit critical substantiating documentation or be taken out of context so due care must be exercised in this regard.

Test Date: October 1, 2020

Date Issued: October 9, 2020

Revision Log

Revision No.	Revision Date	Revised Sections	Notes	Initials

INVOLVED PARTIES

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1. REPORT TEXT

1.1 Purpose

Emission Technologies, Inc. (ETI) was contracted by Cairncross & Hempelmann to perform air quality testing on the Cadman Kenmore Hot Mix Asphalt Plant located in Kenmore, WA. The testing protocol was developed by ETI to include pollutant parameters typically measured at new asphalt plant installations in the Seattle area. The testing methods used met both United States Environmental Protection Agency (EPA) and Puget Sound Clean Air Authority (PSCAA) guidelines.

1.2 Test Overview

On October 1, 2020, ETI provided personnel and equipment to perform the emission measurement tests presented in Table 1.1. Source tests for each parameter are specified following the standard Environmental Protection Agency (EPA) methods listed in 40 CFR 60. Following, Table 1.1 outlines the emission sampling protocol that was employed.

Table 1.1 Test Protocol

Parameters	Test Method	Sample Series	Time per Run
Sample Port Location	EPA Method 1	As Needed	As Needed
Flows and Moisture	EPA Method 2-4	3 runs	60 minutes
PM	EPA Method 5 w/PSCAA 504	3 runs	60 minutes
Opacity	EPA Method 9	3 runs	60 minutes
NO_x	EPA Method 7E	3 runs	60 minutes
CO	EPA Method 10	3 runs	60 minutes

Testing was conducted on the rectangular stack with 5 sampling ports. Gas samples were extracted from three different points (16.7, 50.0, and 83.3 percent of the stack along a traverse across the diameter of the stack during stable operating conditions.) No significant variations in pollutant concentrations were observed among the points.

1.3 Overview of the Sampling Methods

A brief description of each sampling method is given below. A complete method text from the Environmental Protection Agency (EPA) can be found at the following web site: http://www.epa.gov/ttn/emc/.

Calculations are performed retaining at least five significant figures for intermediate results. The final number is rounded according to EPA "Performance Test Calculation Guidelines".

<u>EPA Methods 3A, 7E and 10 for the Determination of O_2, NO_x and CO</u>

The testing methodology for O_2, NO_x and CO utilizes continuously operated gas analyzers. Sample gases are extracted through a heated probe/glass fiber filter assembly. A calibration gas purge valve is fitted ahead of the filter assembly for introducing calibration gases to the analyzer system. The samples are transported through Teflon sample lines to a portable unit containing the analyzers. Each of the samples is conditioned while a constant sample extraction rate is maintained. The analyzers detect the concentration of analyte gas within the sample and produced an electrical output signal proportional to the analyte gas concentration. The electrical signal is recorded on a digital data acquisition system.

Instrument calibrations (zero and span checks) and linearity determinations are accomplished as described in EPA Method 7E, by sending EPA Protocol 1 calibration gases to a location ahead of the filter assembly. A 3-point analyzer calibration error check (±2% of calibration span) is made before the first test run and any time there was a failed system bias test or drift test. System bias and drift checks (≤5% and ≤3% of calibration span respectively) are carried out before and after each run. A NO_2-NO conversion efficiency (≥90% of certified test gas concentration) is conducted. Calibration span means the upper limit of the analyzer's calibration that is set by the choice of high-level calibration gas.

All components of the gas sampling and calibration system are constructed of Teflon, 316 stainless steel, or glass. The sample vacuum/pressure pump head are constructed of 316 stainless steel, Viton O-rings, and a Teflon coated diaphragm.

A stratification test is performed to determine the appropriate number of sample traverse points. Three points on a line passing through the stack centroidal area are used. The points are spaced at 16.7, 50.0, and 83.3 percent of the measurement line. The diluent or the pollutant concentration are evaluated to determine potential stratification of the stack gasses. If the concentration at each traverse point differs from the mean concentration for all traverse points by no more than ±5.0 percent of the mean concentration; or ±0.5 ppm (whichever is less restrictive), the gas stream is considered unstratified and samples may be collected from a single point. If the 5.0 percent or 0.5 ppm criterion is not met, but the concentration at each traverse point differs from the mean concentration for all traverse points by no more than ±10.0 percent of the mean; or ±1.0 ppm (whichever is less restrictive), the gas stream is considered to be minimally stratified, samples may be taken from the three points. If the gas stream is found to be stratified, because the 10.0 percent or 1.0 ppm criterion for a 3-point test is not met twelve traverse points are utilized for the test in accordance with Method 1.

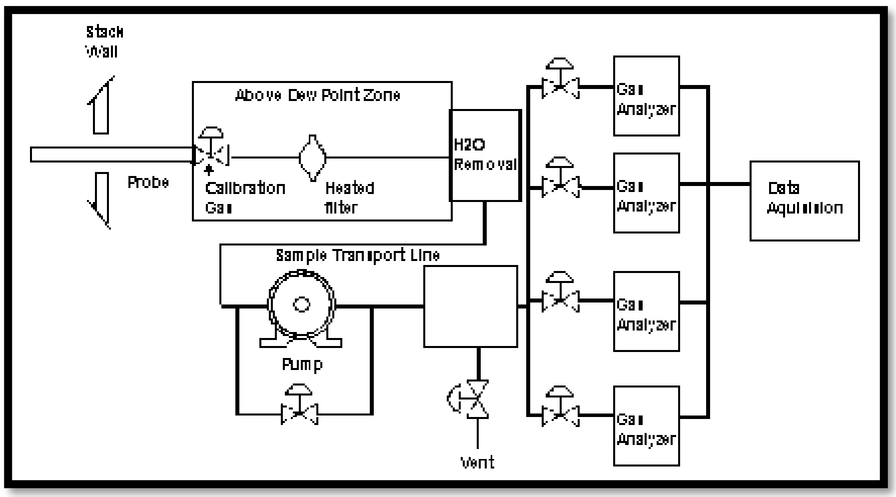


Figure 1.1 Gas Sampling Diagram

EPA Method 5 - Determination of Particulate with PSCAA Resolution 540

Particulate matter was withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 248º ± 25° F. The particulate mass, which includes any material that condenses at or above the filtration temperature, was determined gravimetrically after removal of uncombined water. The sampling train used for these tests consisted of a heated borosilicate glass nozzle/probe assembly, a glass filter holder inside a heated filter box, glass impingers, umbilical cords, the control box and the sampling pump. Before and after each Method 5 test run, the probe and nozzle were washed. The weight of the particulate collected in the probe and nozzle wash was added to the weight collected on the filter to obtain front half particulate levels.

The condensable particulate matter (CPM), back half fraction, is the material that condenses after passing through the filter and is analyzed using EPA Method 5 modified by PSCAA board resolution

540. The method uses a Method 5 sampling train with the impinger contents recovered and impingers rinsed with acetone - the organic and aqueous fractions of the recovered impinger liquid are separated. The organic, aqueous and acetone wash fractions are then taken to dryness and residues weighed. The total of all back half fractions represents the Back-half particulate.

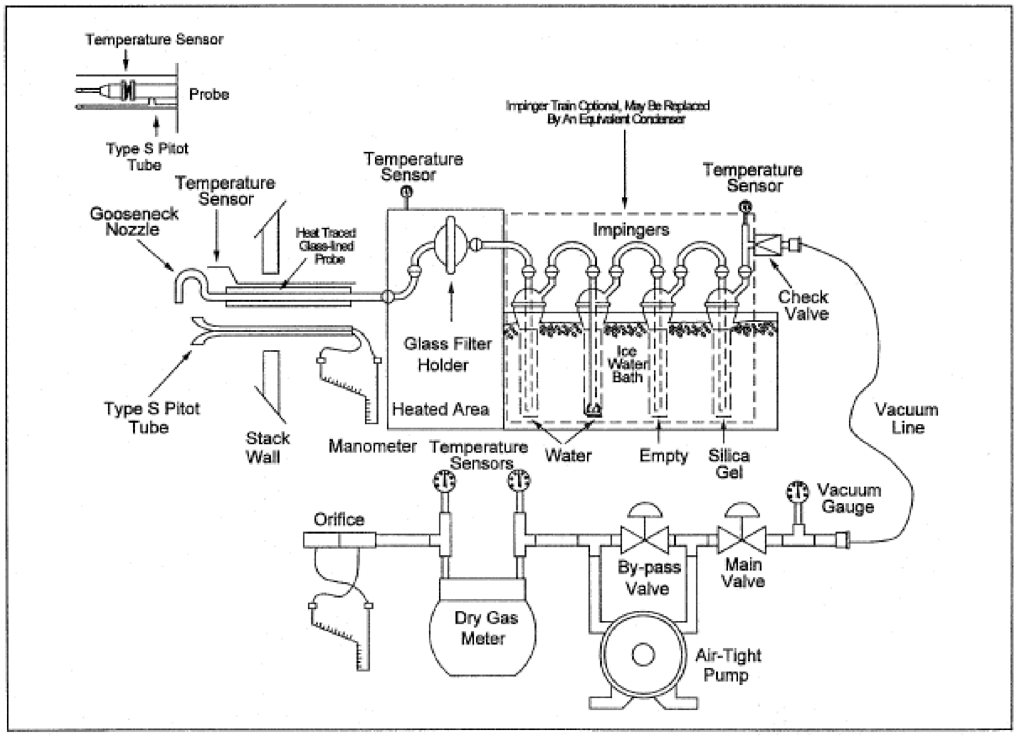


Figure 1.2 EPA Method 5 Sampling Train Diagram

EPA Method 9 - Visual Determination of Opacity

This method is applicable for the determination of the opacity of emissions from stationary sources by a qualified observer. The method includes procedures for the training and certification of observers and procedures to be used in the field for determination of plume opacity. The opacity of emissions from stationary sources is determined at the point of greatest opacity in that portion of the plume where water vapor is not present. The observer does not look at the plume continuously, but instead observes the plume momentarily at 15-second intervals. Opacity is determined as an average of 24 consecutive observations recorded at 15-second intervals. Sets need not be consecutive in time and no two sets can overlap.

1.4 Results

The results of the tests are summarized in Table 1.2 below. The plant does not have specified regulatory limits, although the results were under the typical regulatory limits set by the EPA and PSCAA for modern facilities.

Table 1.2 Performance Test Results

Parameter	Test Result Average
TOTAL PM gr/dscf	0.004
PM Filterable gr/dscf @ 7% O2	0.002
NO_x ppmdv @ 3% O_2	39
CO ppmdv @ 3% O_2	118
Opacity, %	0.0

1.5 Anomalies

There were no anomalies during the test.

1.6 Process Overview

Figure 1.3 below illustrates a conceptual diagram of the testing arrangement.

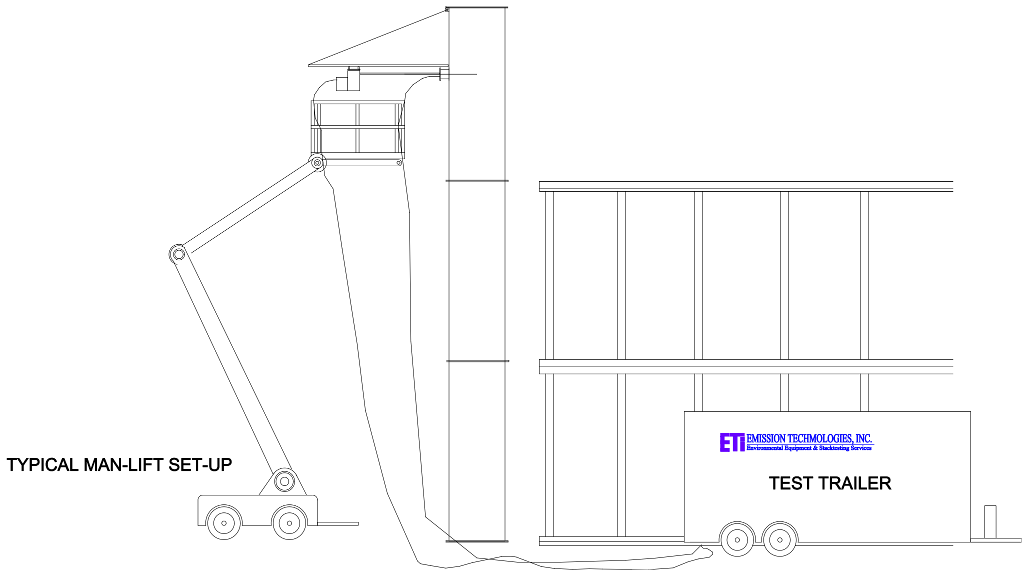


Figure 1.3 **Typical Test arrangement**

1.7 Participants

The following participants were involved for ETI with the testing program:

- Mr. Rob Wilson, Project Manager
- Mr. Robert Howell, Field Technician
- Mr. Danny Dizon P.E., Quality Assurance

2. SUMMARY

Table 2.1 Gas Summary

Client: Cadman Kenmore
Site: Kenmore
Unit: Hot Mix Asphalt Plant

Date: 10/01/20
ETI Job No: 3128-20

O_2	Run Number 1	2	3	Average
%	14.65	14.68	14.67	**14.7**

CO_2	Run Number: 1	2	3	Average
%	4.01	4.10	4.04	**4.1**

NO_x	Run Number: 1	2	3	Average
ppmdv	13.7	13.4	13.9	**13.7**
ppmdv @ 3% O_2	39.3	38.6	39.9	**39.3**

CO	Run Number: 1	2	3	Average
ppmdv	40.1	41.5	41.8	**41.1**
ppmdv @ 3% O_2	114.7	119.3	120.1	**118.0**

Table 2.2 Particulate M5 Summary

Client: Cadman Kenmore				**Date:** 10/01/20
Unit: Kenmore				**ETI Job Number:** 3128-20
Filterable Catch	**Run Number**			
	1	**2**	**3**	**Average**
P&N Acetone wash, mg	1.3	1.0	1.1	**1.13**
Acetone Blank	ND	ND	ND	
Filter, mg	1.8	2.4	2.6	
Blank Filter	ND	ND	ND	
mg (Filterable)	3.10	3.40	3.70	**3.40**
Condensable Catch	**Run Number**			
	1	**2**	**3**	**Average**
Organic Fraction				
mg	1.00	0.70	0.80	**0.83**
Blank, mg	ND	ND	ND	
Inorganic Fraction				
mg	3.50	7.10	6.00	**5.53**
Inorganic Blank, mg	0.40	0.40	0.40	
Acetone Wash - PSCAA				
Impinger Acetone Wash, mg	0.65	0.62	0.91	**0.73**
Acetone Blank, mg	ND	ND	ND	
Total Front Half	**Run Number**			
	1	**2**	**3**	**Average**
mg	3.10	3.40	3.70	**3.4**
gr/dscf	0.0012	0.0014	0.0014	**0.001**
gr/dscf @ 7%O_2	0.0022	0.0024	0.0027	**0.002**
Total Back Half	**Run Number**			
	1	**2**	**3**	**Average**
mg	4.75	8.05	7.05	**6.62**
gr/dscf	0.0019	0.0033	0.0028	**0.003**
Total Particulate	**Run Number**			
	1	**2**	**3**	**Average**
mg	7.85	11.45	10.75	**10.02**
gr/dscf	0.0032	0.0046	0.0042	**0.004**

Table 2.3 Opacity Summary

Client: Cadman Kenmore
Unit: Hot Mix Asphalt Plant
ETI Job Number: 3128-20

Opacity EPA 9									
Run 1 - Number of Observations = 240									
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0
Opacity Sum					**0.0%**				
Opacity Average					**0.0%**				

Opacity EPA 9									
Run 2 - Number of Observations = 240									
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0
Opacity Sum					**0.0%**				
Opacity Average					**0.0%**				

Opacity EPA 9									
Run 3 - Number of Observations = 240									
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0
Opacity Sum					**0.0%**				
Opacity Average					**0.0%**				
Opacity Average of 3 Runs					**0.0%**				

3. CALIBRATION DATA

Table 3.1 Analyzer and Calibration Gas Information

Client:	Cadman Kenmore	**Date:**	10/01/20
Site:	Kenmore		
Unit:	Hot Mix Asphalt Plant	**ETI Job No:**	3128-20

Instrument Information:

Instrument	Channel	Make	Model	Serial No.
O_2	1	Horiba	PG250	6103006
CO_2	2	Horiba	PG250	6103006
NO_x	3	Horiba	PG250	6103006
CO	4	Horiba	PG250	6103006
Recorders	-			

Calibration Information:

Instrument	Units	Zero	Span	Range	Gas Cyl. No.	Gas Flow (L/min)
O_2	%	N_2	12.15	21.02	EB0052889	5.0
O_2	%	N_2	21.02	21.02	EB0042808	5.0
CO_2	%	N_2	11.63	20.87	EB0052889	5.0
CO_2	%	N_2	20.87	20.87	EB0042808	5.0
NO_x	ppmdv	N_2	24.96	53.20	CC702109	5.0
NO_x	ppmdv	N_2	53.20	53.20	SX63432	5.0
CO	ppmdv	N_2	24.30	51.80	CC702109	5.0
CO	ppmdv	N_2	51.80	51.80	SX63432	5.0

Table 3.2 O_2 Analyzer Calibration Data

Client: Cadman Kenmore **Date:** 10/01/20
Site: Kenmore
Unit: Hot Mix Asphalt Plant **ETI Job No:** 3128-20

3-Point Linearity Check (Internal Cal)	Direct Calibration Mode			
	Cylinder Value (ppmdv)	Calibration Response (ppmdv)	Difference from Cylinder Value	Difference (% of Calibration Span)
Zero Gas	0.00	0.10	0.10	0.48%
Mid-Range Gas	12.15	12.10	0.05	0.24%
High-Range Gas	21.02	21.00	0.02	0.10%

40 CFR 60 Method 3A-13.0

Analyzer calibration error ≤2.0% of calibration span or 0.5% absolute difference

System Bias must be ≤5.0% of calibration span or 0.5% absolute difference

Calibration Drift must be ≤3.0% of calibration span or 0.5% absolute difference

Calibration Span = High-Range Gas Cylinder Value

Bias Gas = Mid 12.15

System Bias and Calibration Drift Assessments	Run	Analyzer Calibration Response (ppmdv) Direct	System	Direct - System Difference	Pre - Post System Response	System Bias	Calibration Drift
Zero Gas	**Pre**	0.10	0.15	0.05		0.24%	
Upscale Gas		12.10	12.15	0.05		0.24%	
Zero Gas	**1**	0.10	0.20	0.10	0.05	0.48%	0.24%
Upscale Gas		12.10	12.10	0.00	0.05	0.00%	0.24%
Zero Gas	**2**	0.10	0.20	0.10	0.00	0.48%	0.00%
Upscale Gas		12.10	12.20	0.10	0.10	0.48%	0.48%
Zero Gas	**3**	0.10	0.10	0.00	0.10	0.00%	0.48%
Upscale Gas		12.10	12.10	0.00	0.10	0.00%	0.48%

Table 3.3 CO_2 Analyzer Calibration Data

Client: Cadman Kenmore **Date:** 10/01/20
Site: Kenmore
Unit: Hot Mix Asphalt Plant **ETI Job No:** 3128-20

3-Point Linearity Check (Internal Cal)	Direct Calibration Mode			
	Cylinder Value (ppmdv)	Calibration Response (ppmdv)	Difference from Cylinder Value	Difference (% of Calibration Span)
Zero Gas	0.00	0.10	0.10	0.48%
Mid-Range Gas	11.63	11.50	0.13	0.62%
High-Range Gas	20.87	21.00	0.13	0.62%

40 CFR 60 Method 3A-13.0

Analyzer calibration error ≤2.0% of calibration span or 0.5% absolute difference

System Bias must be ≤5.0% of calibration span or 0.5% absolute difference

Calibration Drift must be ≤3.0% of calibration span or 0.5% absolute difference

Calibration Span = High-Range Gas Cylinder Value

Bias Gas = Mid 11.63

System Bias and Calibration Drift Assessments	Run	Analyzer Calibration Response (ppmdv)		Direct - System Difference	Pre - Post System Response	System Bias	Calibration Drift
		Direct	System				
Zero Gas	**Pre**	0.10	0.20	0.10		0.48%	
Upscale Gas		11.50	11.40	0.10		0.48%	
Zero Gas	**1**	0.10	0.25	0.15	0.05	0.72%	0.24%
Upscale Gas		11.50	11.50	0.00	0.10	0.00%	0.48%
Zero Gas	**2**	0.10	0.20	0.10	0.05	0.48%	0.24%
Upscale Gas		11.50	11.40	0.10	0.10	0.48%	0.48%
Zero Gas	**3**	0.10	0.15	0.05	0.05	0.24%	0.24%
Upscale Gas		11.50	11.45	0.05	0.05	0.24%	0.24%

Table 3.4 NO_x Analyzer Calibration Data

Client: Cadman Kenmore **Date:** 10/01/20
Site: Kenmore
Unit: Hot Mix Asphalt Plant **ETI Job No:** 3128-20

3-Point Linearity Check (Internal Cal)	Direct Calibration Mode			
	Cylinder Value (ppmdv)	Calibration Response (ppmdv)	Difference from Cylinder Value	Difference (% of Calibration Span)
Zero Gas	0.00	0.30	0.3	0.56%
Mid-Range Gas	24.96	24.60	0.4	0.68%
High-Range Gas	53.20	53.10	0.1	0.19%

40 CFR 60 Method 7E-13.0
Analyzer calibration error ≤2.0% of calibration span or 0.5 ppmv absolute difference
System Bias must be ≤5.0% of calibration span or 0.5 ppmv absolute difference
Calibration Drift must be ≤3.0% of calibration span or 0.5 ppmv absolute difference
Calibration Span = High-Range Gas Cylinder Value

Bias Gas = MID 25.0

System Bias and Calibration Drift Assessments	Run	Analyzer Calibration Response (ppmdv) Direct	System	Direct - System Difference	Pre - Post System Response	System Bias	Calibration Drift
Zero Gas	**Pre**	0.30	0.10	0.2		0.38%	
Upscale Gas		24.60	24.40	0.2		0.38%	
Zero Gas	**1**	0.30	0.20	0.1	0.1	0.19%	0.19%
Upscale Gas		24.60	24.80	0.2	0.4	0.38%	0.75%
Zero Gas	**2**	0.30	0.20	0.1	0.0	0.19%	0.00%
Upscale Gas		24.60	24.30	0.3	0.5	0.56%	0.94%
Zero Gas	**3**	0.30	0.20	0.1	0.0	0.19%	0.00%
Upscale Gas		24.60	24.50	0.1	0.2	0.19%	0.38%

Table 3.5 CO Analyzer Calibration Data

Client:	Cadman Kenmore	**Date:**	10/01/20
Site:	Kenmore		
Unit:	Hot Mix Asphalt Plant	**ETI Job No:**	3128-20

3-Point Linearity Check (Internal Cal)	Direct Calibration Mode			
	Cylinder Value (ppmdv)	Calibration Response (ppmdv)	Difference from Cylinder Value	Difference (% of Calibration Span)
Zero Gas	0.00	0.00	0.0	0.00%
Mid-Range Gas	24.30	24.50	0.2	0.39%
High-Range Gas	51.80	51.90	0.1	0.19%

40 CFR 60 Method 10-13.0

Analyzer calibration error ≤2.0% of calibration span or 0.5 ppmv absolute difference

System Bias must be ≤5.0% of calibration span or 0.5 ppmv absolute difference

Calibration Drift must be ≤3.0% of calibration span or 0.5 ppmv absolute difference

Calibration Span = High-Range Gas Cylinder Value

Bias Gas = High 51.8

System Bias and Calibration Drift Assessments	Run	Analyzer Calibration Response (ppmdv) Direct	System	Direct - System Difference	Pre - Post System Response	System Bias	Calibration Drift
Zero Gas	**Pre**	0.00	0.20	0.2		0.39%	
Upscale Gas		51.80	52.30	0.5		0.97%	
Zero Gas	**1**	0.00	0.10	0.1	0.1	0.19%	0.19%
Upscale Gas		51.80	52.40	0.6	0.1	1.16%	0.19%
Zero Gas	**2**	0.00	0.30	0.3	0.2	0.58%	0.39%
Upscale Gas		51.80	52.40	0.6	0.0	1.16%	0.00%
Zero Gas	**3**	0.00	-0.10	0.1	0.4	0.19%	0.77%
Upscale Gas		51.80	52.50	0.7	0.1	1.35%	0.19%

4. ETI FIELD TEST DATA

Table 4.1 Field Data – Gases Run 1

Client: Cadman Kenmore
Unit: Hot Mix Asphalt Plant
Date: 10/01/20

Run: 1
Start Time: 8:02
End Time: 9:01

Raw Emission Data: Measurement Time	O_2 %	CO_2 %	NO_x ppmdv	CO ppmdv
8:02	15.6	3.7	13.8	47
8:03	15.5	3.8	14.0	46
8:04	15.6	3.8	14.0	46
8:05	15.4	3.8	14.0	45
8:06	15.3	3.9	14.5	44
8:07	15.0	3.9	13.0	40
8:08	14.9	3.9	13.0	41
8:09	14.5	3.9	13.0	44
8:10	14.7	4.0	12.4	42
8:11	14.6	4.0	12.5	42
8:12	14.4	4.1	12.6	43
8:13	14.3	4.1	13.6	39
8:14	14.6	4.2	14.0	40
8:15	14.3	4.3	15.0	39
8:16	14.4	4.3	14.4	41
8:17	14.4	4.3	14.4	42
8:18	14.2	4.4	14.6	40
8:19	14.3	4.3	14.0	39
8:20	14.4	4.3	14.0	40
8:21	14.3	4.2	14.1	40
8:22	14.4	4.2	14.4	41
8:23	14.7	4.2	14.0	41
8:24	14.5	4.2	14.1	42
8:25	14.4	4.1	14.0	40
8:26	14.6	4.0	13.5	39
8:27	14.5	4.0	13.5	41
8:28	14.7	4.0	13.5	39
8:29	14.8	3.9	13.8	37
8:30	14.5	4.0	13.5	38
8:31	14.4	4.0	13.6	36
8:32	14.3	4.1	13.8	36
8:33	14.5	4.2	13.9	35
8:34	14.6	4.3	13.5	38
8:35	14.7	4.3	12.5	39
8:36	14.5	4.2	12.5	40
8:37	14.2	4.4	12.9	38
8:38	14.1	4.0	12.6	39
8:39	13.9	4.3	12.6	40
8:40	13.8	4.0	12.7	41
8:41	14.1	4.1	12.6	42
8:42	14.0	4.1	12.8	43
8:43	13.9	4.1	12.6	44
8:44	13.9	4.1	12.9	42
8:45	13.9	4.1	12.5	43
8:46	13.8	4.2	12.8	41
8:47	13.9	4.2	13.0	40
8:48	13.7	3.8	13.1	40
8:49	13.6	3.7	13.1	41
8:50	13.8	4.0	13.0	41
8:51	14.1	4.2	13.0	42
8:52	14.5	4.1	13.1	42
8:53	14.4	4.1	13.3	43
8:54	14.4	4.1	13.4	41
8:55	14.4	4.1	13.0	40
8:56	14.3	4.2	13.0	42
8:57	14.4	4.2	13.0	41
8:58	14.2	4.1	13.0	42
8:59	14.1	4.1	13.1	42
9:00	14.1	4.1	13.2	43
9:01	14.1	4.1	13.1	45
Raw Avg:	**14.59**	**4.09**	**13.6**	**40.5**
Bias Corrected Emissions:	**14.65**	**4.01**	**13.7**	**40.1**

Table 4.2 Field Data – Gases Run 2

Client: Cadman Kenmore				**Run:** 2
Unit: Hot Mix Asphalt Plant				**Start Time:** 9:29
Date: 10/01/20				**End Time:** 10:28

Raw Emission Data: Measurement Time	O_2 %	CO_2 %	NO_x ppmdv	CO ppmdv
9:29	15.1	3.9	12.1	48.1
9:30	15.0	4.0	12.8	46.2
9:31	15.0	4.0	13.2	45.1
9:32	14.9	4.1	13.7	44.7
9:33	14.9	4.2	13.3	44.8
9:34	14.9	4.2	13.3	45.0
9:35	14.8	4.1	13.1	45.3
9:36	14.8	4.1	13.3	45.1
9:37	14.7	4.3	13.4	45.4
9:38	14.5	4.5	13.2	45.5
9:39	14.2	4.4	13.4	43.2
9:40	14.4	4.4	13.5	44.1
9:41	14.4	4.5	13.7	43.5
9:42	14.3	4.6	13.8	42.8
9:43	14.1	4.6	13.9	42.5
9:44	14.3	4.6	13.8	42.6
9:45	14.2	4.4	14.2	43.1
9:46	14.1	4.3	14.2	42.8
9:47	14.4	4.5	14.5	43.2
9:48	14.6	4.4	14.1	41.2
9:49	14.6	4.4	13.9	40.8
9:50	14.8	4.5	13.8	39.9
9:51	14.9	4.6	13.7	39.5
9:52	14.7	4.2	13.9	39.0
9:53	14.9	4.1	13.4	38.6
9:54	14.9	4.2	13.1	38.0
9:55	15.0	4.2	13.0	38.0
9:56	15.1	4.0	12.9	37.5
9:57	15.3	3.9	12.8	37.3
9:58	15.0	3.9	12.6	37.0
9:59	15.2	4.0	12.9	37.0
10:00	15.2	3.8	12.6	36.9
10:01	15.3	3.9	12.8	38.7
10:02	15.1	4.0	13.0	40.1
10:03	15.1	4.1	12.9	40.9
10:04	15.0	4.3	13.0	42.0
10:05	14.8	4.1	13.2	41.3
10:06	15.0	4.4	13.2	41.5
10:07	15.0	4.4	13.4	42.0
10:08	14.9	4.5	13.5	42.5
10:09	14.8	4.6	13.5	42.8
10:10	14.6	4.4	13.5	42.4
10:11	14.5	4.3	13.6	42.3
10:12	14.5	4.1	13.3	42.0
10:13	14.6	4.3	13.3	42.5
10:14	14.5	4.1	13.4	42.8
10:15	14.4	3.8	13.2	43.1
10:16	14.4	3.7	13.0	42.9
10:17	13.8	4.5	13.1	43.0
10:18	14.1	4.1	13.5	42.8
10:19	14.5	4.3	13.1	42.6
10:20	14.4	4.1	13.0	42.0
10:21	14.4	4.0	12.8	42.1
10:22	14.4	3.9	12.9	41.5
10:23	14.3	3.8	12.8	41.7
10:24	14.4	3.8	13.0	41.5
10:25	14.2	3.9	12.9	41.6
10:26	14.1	3.9	13.1	41.3
10:27	14.1	4.0	13.0	42.1
10:28	14.1	4.0	13.0	42.6
Raw Avg:	**14.64**	**4.19**	**13.3**	**42.0**
Bias Corrected Emissions:	**14.68**	**4.10**	**13.4**	**41.5**

Table 4.3 Field Data – Gases Run 3

Client: Cadman Kenmore					**Run:** 3
Unit: Hot Mix Asphalt Plant					**Start Time:** 11:11
Date: 10/01/20					**End Time:** 12:10

Raw Emission Data: Measurement Time	O_2 %	CO_2 %	NO_x ppmdv	CO ppmdv
11:11	15.4	3.7	13.4	40.0
11:12	15.3	3.7	13.5	41.6
11:13	15.4	3.7	13.6	41.5
11:14	15.4	3.8	13.6	41.3
11:15	15.2	3.8	13.8	41.5
11:16	15.1	3.8	13.6	42.0
11:17	15.2	3.8	13.7	42.5
11:18	15.0	3.9	13.6	42.8
11:19	15.1	3.8	13.3	42.4
11:20	14.8	3.8	14.0	42.3
11:21	14.9	4.1	14.2	42.0
11:22	15.1	3.9	14.0	42.5
11:23	15.0	3.9	13.9	42.8
11:24	15.0	4.0	14.0	43.1
11:25	14.9	3.8	13.7	42.9
11:26	15.1	3.9	13.8	41.1
11:27	15.1	3.9	13.7	41.3
11:28	15.0	3.9	13.5	41.3
11:29	14.9	4.0	13.9	41.7
11:30	14.8	4.0	13.6	41.6
11:31	14.7	4.1	14.0	41.5
11:32	14.5	4.1	13.9	41.3
11:33	14.4	4.0	13.8	41.5
11:34	14.7	4.2	14.0	41.4
11:35	15.0	4.2	14.1	41.9
11:36	14.8	4.1	14.2	42.0
11:37	14.5	4.2	14.1	42.5
11:38	14.4	4.3	14.3	43.9
11:39	14.4	4.3	14.3	42.0
11:40	14.4	4.4	14.3	41.9
11:41	14.3	4.5	14.3	41.8
11:42	14.3	4.5	14.4	41.6
11:43	14.3	4.4	14.2	41.5
11:44	14.4	4.4	14.2	41.3
11:45	14.4	4.3	14.6	41.5
11:46	14.3	4.5	14.3	42.0
11:47	14.3	4.1	14.6	42.5
11:48	14.2	4.3	14.7	42.8
11:49	14.2	4.4	14.8	42.4
11:50	14.3	4.3	14.5	42.3
11:51	14.3	4.2	14.0	42.0
11:52	14.4	4.0	13.4	42.5
11:53	14.2	4.3	13.1	42.8
11:54	14.3	4.4	13.0	43.1
11:55	14.4	4.2	12.9	42.9
11:56	14.5	4.0	13.0	43.4
11:57	14.4	4.1	13.0	43.5
11:58	14.5	3.9	13.1	42.9
11:59	14.6	4.0	12.8	43.6
12:00	14.3	4.0	12.7	43.8
12:01	14.6	3.9	12.5	43.9
12:02	14.5	4.0	12.8	43.9
12:03	14.3	4.1	13.1	43.9
12:04	14.4	4.0	13.0	43.6
12:05	14.5	4.1	12.9	42.7
12:06	14.4	4.2	13.0	42.6
12:07	14.5	4.2	12.8	42.5
12:08	14.4	4.1	12.9	42.5
12:09	14.2	4.1	13.0	42.8
12:10	14.3	4.3	13.1	43.0
Raw Avg:	**14.64**	**4.08**	**13.7**	**42.3**
Bias Corrected Emissions:	**14.67**	**4.04**	**13.9**	**41.8**

Table 4.4 Field Data – Particulate Run 1

Location:	Cadman Kenmore	Start Time:	8:05 AM
RUN No.	1 of 3		
Date:	10/01/20	JOB No.	3128-20

Standard Temperature	68 °F	Standard Pressure	29.92 in Hg

STACK DATA		EQUIPMENT		ESTIMATES	
% Moisture:	15 % est.	METER BOX:	L	Est. Tm:	75 °F
Barometric:	29.70 in Hg	Y:	1.007	Est. Ts:	180 °F
Static Press:	-0.20 in H_2O	ΔH@:	1.8 in H_2O	Est. dP:	0.7 in H_2O
Stack Press:	29.69 in Hg	PITOT:	eti6	Est. Dn:	0.22 inches
%CO2:	4.0 %	Cp:	0.84		
%O2:	14.5 %	NOZZLE:	ETI-22.2a		
%N2/CO:	81.50 %	Dn:	0.225 in		
Md:	29.22 lb/lb-mole	Stack Area:	8.670 ft^2		
Ms:	27.54 lb/lb-mole	# of Points:	25 points		

IMPINGERS	INITIAL WT	FINAL WT
H20	761.7	846.8
H20	642.0	679.4
Empty	653.7	658.3
Silical	851.6	857.7

LEAK CHECKS		
DGM pre Leak check	0.002	cf
DGM post Leak check	0.001	cf
Pitot Leak check	good	4.4"
DGM Vacuum	12.000	in. Hg

FINAL CATCH
Liquid Vol. (ml)
133.2

Sample Point	Sample Time (minutes)		Dry Gas Meter	Pitot	Gas Temperatures (°F)			Orifice Press.		Pump	Gas Temps		K FACTOR =		1.758
				ΔP	DGM			ΔH (in H_2O)		Vac.	(°F)		Imp.	% ISO	Vs
	Begin	End	Reading (ft^3)	(in. H_2O)	Inlet	Outlet	Stack	Ideal	Actual	(in Hg)	Probe	Filter	Exit		(fps)
1	0.00	2.50	377.627	0.540	63.0	64.0	194	0.911	1.000	3	250	252	60	105.6	47.20
2	2.50	5.00	379.018	0.610	63.0	64.0	193	1.030	1.100	3	250	251	59	102.5	50.13
3	5.00	7.50	380.453	0.620	65.0	64.0	193	1.049	1.100	3	250	251	59	102.2	50.54
4	7.50	10.00	381.899	0.780	66.0	65.0	193	1.321	1.400	3	521	251	59	101.6	56.69
5	10.00	12.50	383.512	0.860	66.0	65.0	193	1.456	1.500	3	251	251	59	105.0	59.52
6	12.50	15.00	385.263	0.470	67.0	65.0	194	0.796	1.000	3	251	251	59	103.9	44.04
7	15.00	17.50	386.545	0.490	67.0	65.0	193	0.832	1.000	3	251	251	58	101.6	44.93
8	17.50	20.00	387.827	0.520	67.0	65.0	194	0.881	1.000	3	252	251	58	94.4	46.32
9	20.00	22.50	389.053	0.590	68.0	65.0	193	1.002	1.100	3	252	251	58	108.2	49.30
10	22.50	25.00	390.551	0.680	68.0	65.0	191	1.158	1.200	3	252	251	58	104.2	52.85
11	25.00	27.50	392.102	0.650	68.0	66.0	191	1.108	1.200	3	251	251	58	106.4	51.67
12	27.50	30.00	393.652	0.650	68.0	66.0	190	1.110	1.200	4	251	251	58	106.2	51.63
13	30.00	32.50	395.200	0.670	69.0	66.0	190	1.145	1.200	4	250	251	57	104.9	52.42
14	32.50	35.00	396.755	0.710	69.0	66.0	189	1.215	1.300	4	250	251	57	102.0	53.92
15	35.00	37.50	398.311	0.800	69.0	66.0	190	1.366	1.400	4	250	251	57	101.7	57.28
16	37.50	40.00	399.957	0.720	69.0	66.0	190	1.230	1.300	4	250	251	57	99.3	54.34
17	40.00	42.50	401.482	0.700	70.0	66.0	191	1.195	1.300	4	250	251	57	99.4	53.62
18	42.50	45.00	402.988	0.690	70.0	67.0	191	1.180	1.200	4	250	251	56	103.7	53.23
19	45.00	47.50	404.549	0.760	70.0	67.0	191	1.299	1.400	4	251	251	56	100.4	55.87
20	47.50	50.00	406.135	0.700	70.0	67.0	192	1.195	1.300	4	251	251	56	104.4	53.66
21	50.00	52.50	407.717	0.770	70.0	67.0	192	1.314	1.400	4	251	251	56	100.5	56.28
22	52.50	55.00	409.313	0.790	70.0	67.0	192	1.348	1.400	4	251	251	57	105.7	57.00
23	55.00	57.50	411.013	0.800	70.0	68.0	192	1.366	1.400	4	251	251	57	103.5	57.36
24	57.50	60.00	412.690	0.760	70.0	68.0	192	1.298	1.400	4	251	251	58	107.8	55.91
25	60.00	62.50	414.393	0.560	70.0	68.0	191	0.959	1.000	4	251	251	59	101.2	47.96
	Final DGM:		415.767												

RESULTS	Run Time	Vm	ΔP (H_2O)	Tm	Ts	Vac.	ΔH (H_2O)
	62.50 min	38.140 ft^3	0.819 in	67.0 °F	191.8 °F	4	1.232 in

Table 4.5 Field Data – Particulate Run 2

Location: Cadman Kenmore   Start Time: 9:29 AM   RUN No. 2 of 3
Date: 10/01/20   JOB No. 3128-20

Standard Temperature 68 °F		Standard Pressure 29.92 in Hg				IMPINGERS	INITIAL WT	FINAL WT
STACK DATA		EQUIPMENT		ESTIMATES		H20	720.9	815.6
% Moisture:	15 % est.	METER BOX:	L	Est. Tm:	75 °F	H20	745.2	770.2
Barometric:	29.70 in Hg	Y:	1.007	Est. Ts:	180 °F	Empty	653.1	665.1
Static Press:	-0.20 in H_2O	ΔH@:	1.8 in H_2O	Est. dP:	0.7 in H_2O	Silical	802.4	811.4
Stack Press:	29.69 in Hg	PITOT:	eti6	Est. Dn:	0.247 inches			
%CO2:	4.2 %	Cp:	0.84	LEAK CHECKS			FINAL CATCH	
%O2:	14.6 %	NOZZLE:	ETI-22.2a	DGM pre Leak check	0.002 cf		Liquid Vol. (ml)	
%N2/CO:	81.20 %	Dn:	0.225 in	DGM post Leak check	0.004 cf			
Md:	29.26 lb/lb-mole	Stack Area:	8.670 ft^2	Pitot Leak check	good 4.0"		140.7	
Ms:	27.57 lb/lb-mole	# of Points:	25 points	DGM Vacuum	10.000 in. Hg			

Sample Point	Sample Time (minutes) Begin	End	Dry Gas Meter Reading (ft^3)	Pitot ΔP (in. H_2O)	Gas Temperatures (°F) DGM Inlet	DGM Outlet	Stack	Orifice Press. ΔH (in H_2O) Ideal	Actual	Pump Vac. (in Hg)	Gas Temps (°F) Probe	Filter	K FACTOR = 1.758 Imp. Exit	% ISO	Vs (fps)
1	0.00	2.50	426.625	0.530	66.0	68.0	172	0.931	1.000	3	251	252	60	103.8	45.94
2	2.50	5.00	428.011	0.530	66.0	68.0	180	0.920	1.000	3	250	251	60	105.9	46.23
3	5.00	7.50	429.416	0.710	67.0	69.0	180	1.233	1.300	3	250	251	60	97.2	53.51
4	7.50	10.00	430.910	0.780	67.0	69.0	182	1.350	1.400	3	521	251	60	102.1	56.17
5	10.00	12.50	432.553	0.810	67.0	69.0	184	1.398	1.500	3	251	251	59	105.7	57.33
6	12.50	15.00	434.282	0.510	68.0	69.0	185	0.880	1.000	3	252	251	59	95.9	45.53
7	15.00	17.50	435.529	0.540	68.0	69.0	185	0.932	1.000	3	252	251	58	93.1	46.85
8	17.50	20.00	436.775	0.610	70.0	69.0	191	1.045	1.100	3	252	251	58	104.4	50.02
9	20.00	22.50	438.255	0.720	70.0	69.0	191	1.233	1.300	4	252	251	58	97.1	54.35
10	22.50	25.00	439.750	0.690	70.0	70.0	191	1.183	1.200	4	252	251	58	103.3	53.20
11	25.00	27.50	441.308	0.680	70.0	70.0	191	1.166	1.200	4	251	251	58	103.4	52.82
12	27.50	30.00	442.857	0.680	71.0	70.0	192	1.165	1.200	4	251	251	58	103.6	52.86
13	30.00	32.50	444.409	0.660	71.0	70.0	192	1.131	1.200	4	250	251	57	105.2	52.07
14	32.50	35.00	445.961	0.720	71.0	70.0	192	1.233	1.300	4	250	251	57	100.2	54.39
15	35.00	37.50	447.505	0.780	71.0	70.0	192	1.336	1.400	4	250	251	57	93.4	56.61
16	37.50	40.00	449.002	0.660	72.0	70.0	192	1.132	1.200	4	250	251	57	98.5	52.07
17	40.00	42.50	450.457	0.670	72.0	70.0	192	1.149	1.200	4	250	251	57	99.2	52.47
18	42.50	45.00	451.933	0.640	72.0	70.0	193	1.096	1.200	4	250	251	56	103.3	51.32
19	45.00	47.50	453.435	0.660	73.0	70.0	193	1.131	1.200	4	251	251	56	101.7	52.11
20	47.50	50.00	454.938	0.670	73.0	70.0	193	1.148	1.200	4	251	251	56	100.4	52.51
21	50.00	52.50	456.433	0.660	73.0	70.0	193	1.131	1.200	4	251	251	56	100.0	52.11
22	52.50	55.00	457.910	0.660	74.0	71.0	193	1.133	1.200	4	251	251	57	101.5	52.11
23	55.00	57.50	459.412	0.730	74.0	71.0	193	1.253	1.300	4	251	251	60	100.1	54.81
24	57.50	60.00	460.970	0.690	74.0	71.0	193	1.185	1.200	4	251	251	60	101.8	53.29
25	60.00	62.50	462.511	0.550	74.0	71.0	193	0.945	1.000	4	251	251	60	106.6	47.57
	Final DGM:		463.952												

RESULTS	Run Time	Vm	ΔP (H_2O)	Tm	Ts	Vac.	ΔH (H_2O)
	62.50 min	37.327 ft^3	0.812 in	70.1 °F	189.1 °F	4	1.200 in

Table 4.6 Field Data – Particulate Run 3

Location: Cadman Kenmore   Start Time: 11:11 AM   RUN No. 3 of 3

Date: 10/01/20   JOB No. 3128-20

Standard Temperature 68 °F	Standard Pressure 29.92 in Hg	IMPINGERS	INITIAL WT	FINAL WT
		H20	606.4	707.4
		H20	797.3	815.2
		Empty	662.7	672.7
		Silical	817.3	827.1

STACK DATA		EQUIPMENT		ESTIMATES	
% Moisture:	15 % est.	METER BOX:	L	Est. Tm:	75 °F
Barometric:	29.70 in Hg	Y:	1.007	Est. Ts:	180 °F
Static Press:	-0.20 in H_2O	ΔH@:	1.8 in H_2O	Est. dP:	0.7 in H_2O
Stack Press:	29.69 in Hg	PITOT:	eti6	Est. Dn:	0.247 inches
%CO2:	4.00 %	Cp:	0.84		
%O2:	14.50 %	NOZZLE:	ETI-22.2a		
%N2/CO:	81.50 %	Dn:	0.225 in		
Md:	29.22 lb/lb-mole	Stack Area:	8.670 ft^2		
Ms:	27.54 lb/lb-mole	# of Points:	25 points		

LEAK CHECKS			FINAL CATCH
DGM pre Leak check	0.005	cf	Liquid Vol. (ml)
DGM post Leak check	0.001	cf	
Pitot Leak check	good	5.4"	138.7
DGM Vacuum	14.000	in. Hg	

K FACTOR = 1.758

Sample Point	Sample Time (minutes) Begin	End	Dry Gas Meter Reading (ft^3)	Pitot ΔP (in. H_2O)	Gas Temperatures (°F) DGM Inlet	DGM Outlet	Stack	Orifice Press. ΔH (in H_2O) Ideal	Actual	Pump Vac. (in Hg)	Gas Temps (°F) Probe	Filter	Imp. Exit	% ISO	Vs (fps)
1	0.00	2.50	472.462	0.560	68.0	69.0	172	0.987	1.000	3	250	252	58	108.5	47.25
2	2.50	5.00	473.956	0.630	68.0	69.0	175	1.104	1.200	3	250	251	58	102.6	50.24
3	5.00	7.50	475.450	0.640	68.0	69.0	180	1.113	1.200	3	250	251	59	102.2	50.83
4	7.50	10.00	476.944	0.800	69.0	69.0	183	1.385	1.500	3	521	251	59	102.2	56.97
5	10.00	12.50	478.611	0.880	69.0	69.0	184	1.521	1.600	3	251	251	59	99.1	59.79
6	12.50	15.00	480.304	0.490	70.0	69.0	188	0.844	1.000	3	251	251	59	105.6	44.76
7	15.00	17.50	481.650	0.510	70.0	69.0	188	0.878	1.000	3	251	251	60	106.4	45.66
8	17.50	20.00	483.033	0.540	71.0	69.0	191	0.926	1.000	3	252	251	60	103.7	47.09
9	20.00	22.50	484.419	0.610	71.0	69.0	190	1.048	1.100	4	252	250	60	105.4	50.01
10	22.50	25.00	485.917	0.700	72.0	69.0	194	1.195	1.300	4	252	250	59	103.9	53.74
11	25.00	27.50	487.494	0.670	73.0	70.0	196	1.143	1.200	4	251	250	58	106.4	52.66
12	27.50	30.00	489.075	0.670	73.0	70.0	193	1.148	1.200	4	251	250	58	106.0	52.54
13	30.00	32.50	490.654	0.690	74.0	70.0	192	1.186	1.200	4	250	250	58	104.1	53.27
14	32.50	35.00	492.230	0.730	74.0	70.0	192	1.254	1.300	4	250	250	58	101.5	54.80
15	35.00	37.50	493.811	0.820	75.0	70.0	192	1.409	1.500	4	250	250	58	106.4	58.08
16	37.50	40.00	495.567	0.740	75.0	70.0	192	1.272	1.300	4	250	250	57	100.6	55.17
17	40.00	42.50	497.146	0.720	75.0	70.0	192	1.238	1.300	4	250	250	57	102.0	54.42
18	42.50	45.00	498.725	0.710	75.0	70.0	192	1.221	1.300	4	250	250	57	102.7	54.04
19	45.00	47.50	500.304	0.780	77.0	71.0	193	1.342	1.400	4	251	250	57	106.0	56.69
20	47.50	50.00	502.014	0.720	77.0	71.0	193	1.240	1.300	4	251	250	57	101.6	54.46
21	50.00	52.50	503.590	0.790	77.0	71.0	193	1.360	1.400	4	251	250	57	104.5	57.05
22	52.50	55.00	505.288	0.810	77.0	71.0	193	1.394	1.500	4	251	250	57	103.6	57.76
23	55.00	57.50	506.991	0.820	77.0	71.0	193	1.411	1.500	4	251	250	57	102.3	58.12
24	57.50	60.00	508.683	0.780	77.0	71.0	193	1.342	1.400	4	251	250	58	104.3	56.69
25	60.00	62.50	510.366	0.580	77.0	71.0	193	0.999	1.000	4	251	250	59	106.6	48.88
	Final DGM:		511.851												

RESULTS	Run Time	Vm	ΔP (H_2O)	Tm	Ts	Vac.	ΔH (H_2O)
	62.50 min	39.389 ft^3	0.832 in	71.5 °F	189.5 °F	4	1.268 in

Table 4.7 Field Data – Particulate M5 Summary

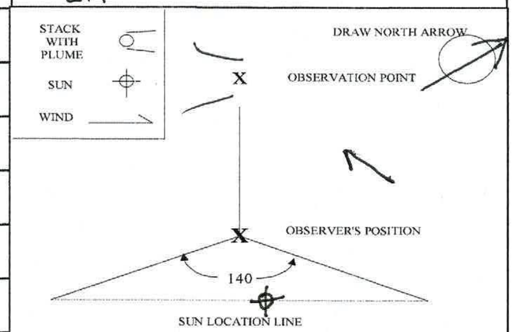
Client: Cadman Kenmore **Date:** 10/01/20
Unit: Hot Mix Asphalt Plant **ETI Job Number:** 3128-20

		Run Number: 1	Run Number: 2	Run Number: 3
Field Data:				
	Run Start Time:	8:02	9:29	11:11
	Run Finish Time:	9:12	10:38	12:26
θ	Sample Time, minutes	62.5	62.5	62.5
	Stack Shape (Circle or Rectangle):		Rectangle	
V_m	Dry Gas Meter Reading,dcf ………………… ....INITIAL:	377.627	426.625	472.462
	FINAL:	415.767	463.952	511.851
V_m	Volume of dry gas sampled, dcf	38.140	37.327	39.389
Y	Meter box calibration factor	1.007	1.007	1.007
P_{bar}	Barometric pressure, inches Hg	29.70	29.70	29.70
P_{static}	Stack static pressure, inches H_2O	-0.20	-0.20	-0.20
ΔH	Differential meter press, inches H_2O	1.232	1.200	1.268
T_m	Meter temperature, degrees F	67.00	70.10	71.50
V_{lc}	Volume of H_2O collected, ml	133.2	140.7	137.6
$\%O_2$	Percent of oxygen in stack gas	14.65	14.68	14.67
$\%CO_2$	Percent carbon dioxide in stack gas	4.01	4.10	4.04
C_p	Type-S pitot tube coefficient	0.84	0.84	0.84
$\sqrt{\Delta P}_{avg}$	Ave. square root of pitot readings, (inches $H_2O)^{1/2}$	0.819	0.812	0.832
T_s	Stack temperature, degrees F	191.80	189.10	189.50
D_s	Stack diameter, feet - CIRCLE			
L_s, W_s	Stack dimensions, feet - RECTANGLE		3.20	2.71
D_n	Nozzle diameter, inches	0.225	0.225	0.225
A_n	Nozzle area, ft^2	0.000276	0.000276	0.000276
Calculated Values:				
$V_{m(std)}$	Meter corrected volume,dscf	38.313	37.275	39.237
$V_{w(std)}$	Volume of water vapor,dscf	6.280	6.634	6.488
B_{ws}	Fraction of H_2O vapor	0.1408	0.1511	0.1419
$\%N_2$	Percent nitrogen in stack gas	81.34	81.22	81.29
M_d	Dry molecular weight of stack gas, lb/lb-mole	29.23	29.24	29.23
M_w	Wet molecular weight of stack gas, lb/lb-mole	27.65	27.55	27.64
A_d	Cross sectional area of stack, ft^2	8.67	8.67	8.67
P_s	Absolute stack gas pressure, inches Hg	29.69	29.69	29.69
V_s	Average stack gas velocity, ft/sec	52.41	51.95	53.16
Q_{std}	Average stack volumetric flowrate, wscfm	21,919	21,816	22,309
Q_{std}	Average stack volumetric flowrate, dscfm	18,832	18,520	19,143
I	Percent isokinetic sampling	102.3	101.2	103.1

Table 4.8 Field Data Opacity Run 1

OPACITY OBSERVATION FORM

Plant Name	Cadman Kenmore
Facility Type	Asphalt
Emission Location	Outlet Stack
City	Kenmore
State	WA
Zip	98028
Describe Plume Backgound	Sky & Trees
Distance From Observer	70'
Background Color	gray/blue Sky
Sky Conditions	blue & smokey
Wind Speed	0-5 mph
Wind Direction	NE
Observer	RWW
Observer's Organization	ETI



OBSERVATION DATE: 10/1/20 START TIME: 0802 am

sec / min	0	15	30	45	COMMENTS
					RUN 1
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

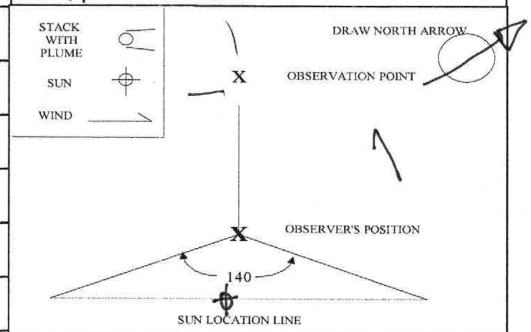
OBSERVATION DATE: 10/1/20 START TIME: continued

sec / min	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Table 4.9 Field Data Opacity Run 2

OPACITY OBSERVATION FORM

Plant Name	Cadman Kenmore
Facility Type	Asphalt
Emission Location	Outlet Stack
City	Kenmore
State	WA
Zip	98028
Describe Plume Backgound	Sky & Trees
Distance From Observer	70'
Background Color	gray/bluesky
Sky Conditions	blue & smokey
Wind Speed	0-5 mph
Wind Direction	NE
Observer	RWW
Observer's Organization	ETI



OBSERVATION DATE: 10/1/20 START TIME: 0929 am

sec / min	0	15	30	45	COMMENTS
1	0	0	0	0	Run 2
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

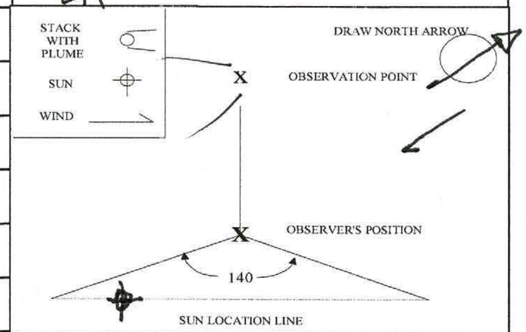
OBSERVATION DATE: 10/1/20 START TIME: Continued

sec / min	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Table 4.10 Field Data Opacity Run 3

OPACITY OBSERVATION FORM

Plant Name: Cadman Kenmore	Observer: RWN
Facility Type: Asphalt	Observer's Organization: ETI
Emission Location: ~~Kenmore~~ Outlet Stack	
City: Kenmore; State: WA; Zip: 98028	
Describe Plume Backgound: Sky & Trees	
Distance From Observer: 70'	
Background Color: gray & blue; Sky Conditions: blue & smokey	
Wind Speed: 0-5; Wind Direction: N	



OBSERVATION DATE: 10/1/20 — START TIME: 11:11 am

sec / min	0	15	30	45	COMMENTS
1	0	0	0	0	R3
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVATION DATE: 10/1/20 — START TIME: Continued

sec / min	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

5. PROCESS DATA

Cadman Kenmore Asphalt - 10/1/2020

Comments	Time	Fuel	Rate of Production
Start of Run 1 - 8:02	8:00	Nat Gas	150 TPH
	8:15	Nat Gas	135 TPH
	8:30	Nat Gas	140 TPH
	8:45	Nat Gas	150 TPH
End of Run 1 - 09:12	9:00	Nat Gas	140 TPH
Start of Run 2 - 9:29	9:30	Nat Gas	140 TPH
	9:45	Nat Gas	135 TPH
	10:00	Nat Gas	140 TPH
	10:15	Nat Gas	150 TPH
End of Run 2 - 10:38	10:30	Nat Gas	140 TPH
Start of Run 3 - 11:11	11:15	Nat Gas	150 TPH
	11:30	Nat Gas	135 TPH
	11:45	Nat Gas	140 TPH
	12:00	Nat Gas	150 TPH
	12:15	Nat Gas	140 TPH
End of Run 3 - 12:26	12:30	Nat Gas	150 TPH

6. QUALITY ASSURANCE AND QUALITY CONTROL

6.1 ETI Quality Assurance/Quality Control Document

Emission Technologies, Inc. continued success is an example of their pride taken in quality testing.

Analytical procedures and environmental measurement data are structured with a quality assurance program which equals or exceeds the minimum QA/QC requirements set forth by the U.S. Environmental Protection Agency (EPA) for each applicable method.

ETI executes the following topics through every test project to ensure valid measurement data:

* Preventable Maintenance
* Pre-test and Post-test Calibration
* Blanks and Spiked Samples
* Field System Checks
* QA/QC Matrix Tables
* Employment of QA/QC Officer

The following table is an activity matrix for Method 8 from the EPA Quality Assurance Handbook for Air Pollution Measurement Systems. By diligently following such activity matrix tables, Emission Technologies, Inc. reports justifiable, valid measurement data.

TABLE 1.1 ACTIVITY MATRIX FOR PROCUREMENT OF APPARATUS & SUPPLIES

APPARATUS	ACCEPTANCE LIMITS	FREQUENCY AND METHOD OF MEASUREMENT	ACTION IF REQUIREMENTS ARE NOT MET
Sampling			
Sampling probe with heating system	Capable of 100° C (212° F) exit air at flow rate of 20 L/min	Visually check; run heating system checkout	Repair, return to supplier, or reject
Probe nozzle	Stainless steel (316); sharp, tapered, leading edge (angle ≤30°); difference between measured ID's ≤0.1 mm (0.004 in.); no nicks, dents, or corrosion. uniquely identified (Meth. 5, Sec. 3.4.2)	Visually check before each test; use a micrometer to measure ID before field use after each repair	Reshape and sharpen, return to the supplier, or reject
Pitot tube	Type-S (Meth. 2, Sec. 3.1.2); attached to probe with impact (high pressure) opening plane even with or above nozzle entry plane	Calibrate according to Meth. 2, Sec. 3.1.2	Repair or return to supplier

TABLE 1.1 (CONTINUED)

APPARATUS	ACCEPTANCE LIMITS	FREQUENCY AND METHOD OF MEASUREMENT	ACTION IF REQUIREMENTS ARE NOT MET
Differential pressure gauge (manometer)	Criteria in Meth. 2, Sec. 3.1.2; agree within 5% of gauge-oil manometer used to calibrate	Check against gauge-oil manometer at a minimum of three points: [0.64(0.025), 12.7(0.5), 25.4(1.0)] mm (in.) H_20	As above
Vacuum gauge	0-760 mm Hg range; ±25 mm (1 in.) Hg accuracy at 380 mm (15 in.) Hg	Check against a mercury U-tube manometer upon receipt	Adjust or return to supplier
Vacuum pump	Capable of maintaining a flow rate of 0.03-0.05 m^3/ min (1-1.7 ft^3/ min) for pump inlet vacuum of 380 mm (15 in.) Hg with pump outlet at 760 mm (29.92 in.) Hg; leak free at 380 mm (15 in.) Hg	Check upon receipt for leaks and capacity	Repair or return to supplier
Orifice meter	ΔH @ of 46.74 ±6.35 mm (1.84 ±0.25 in.) (recommended)	Visually check upon receipt for damage; calibrate against wet test meter	Repair, if possible. otherwise, return to supplier
Impingers	Standard stock glass; pressure drop across impingers not excessive	Visually check upon receipt, check pressure drop (Method 8, Sec. 3.7.1)	Return to supplier
Filter holder	Leak free (Method 8, Sec. 3.7.1)	Visually check before use	As above
Filters	Glass fiber without organic binder designed to remove 99.95% (≤0.05% penetration) of 0.3-μm dioctyl phthalate smoke particles	Manufacture's guarantee that filters meet ASTM standard method D2986-71. observe under light for defects	Return to supplier and replace

TABLE 1.1 (CONTINUED)

APPARATUS	ACCEPTANCE LIMITS	FREQUENCY AND METHOD OF MEASUREMENT	ACTION IF REQUIREMENTS ARE NOT MET
Hydrogen peroxide	30% H_2O_2 reagent grade or certified ACS	Upon receipt, check label for grade or certification	Replace or return to supplier
Potassium iodide	KI reagent grade or certified ACS	As above	As above
Thorin indicator	1-(o-arsonophenylazo)-2-naphthol-3,6 disulfonic acid disodium salt, reagent grade or certified ACS	Upon receipt, check label for grade or certification	As above
Barium perchlorate trihydrate solution	$Ba(ClO_4)_2$ -3H_20, - reagent grade or certified ACS	As above	As above
Sulfuric acid solution	H_2SO_4, 0.0100N $\pm$ 0.0002N	Certified by manufacturer, or standardize against 0.0100N NaOH previously standardized against potassium acid phthalate (primary standard grade)	As above
NO_x Chemiluminescence Analyzer	NO_x to NO conversion efficiency $\geq$ 90%	Before each field test; Introduce a concentration of 40-60 ppm NO_2 to the analyzer in direct cal mode. Calculate converter efficiency: $\text{Eff}_{NO_2} = \frac{C_{Dir}}{C_V} \times 100$	Repair

6.2 Opacity Certification Certificate

Based on the criteria established by British Columbia Ministry of Environment in the "Source Testing Code for the Visual Measurement of the Opacity of Emissions from Stationary Sources" and the score achieved, this

Certificate

is presented to

Robert Wilson

in recognition of successful completion of the
EPA Method 9 Visible Emissions Certification Course
June 18, 2020 Vancouver, British Columbia.

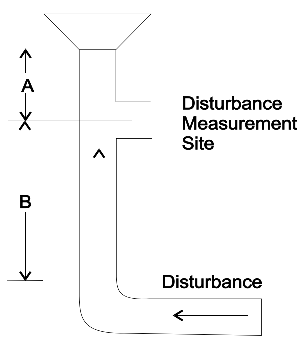
David Plewes
Certifying Instructor
Plewes Environmental Limited

plewes environmental

6.3 Sample Site Selection and Stratification Check

Client: Cadman Kenmore **Date:** 10/01/20
Unit: Hot Mix Asphalt Plant **ETI Job No:** 3128-20

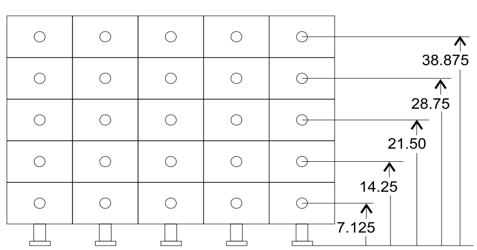
Traverse Point	% of Diameter Distance	Actual Distance	O_2 or CO_2 Conc. (%)	O_2 or CO_2 Conc. % diff. of mean	SO_2 Conc. ppmdv	SO_2 Conc.% diff. of mean	NO_x Conc. ppmdv	NO_x Conc. % diff. of mean	CO Conc. ppmdv	CO Conc. % diff. of mean
1	16.7	10.4	14.60	0.1%	-	-	14.1	0.2%		
2	50.0	21.3	14.45	-1.0%	-	-	13.8	-1.9%		
3	83.3	32.1	14.72	0.9%	-	-	14.3	1.7%		
4	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
		Mean:	14.59		-		14.1			



Traverse Type: gaseous
Flow Straighteners? N
Stack Shape: rectangle
Stack Extensions? N
Stack Construction: steel
Sample Orientation: Horizontal
Stack Dimension (inches), 32.5" x 38.5

For 7E Gaseous Samples	
12 point sample:	>10% of mean
3 point sample:	≤10% or ±1 ppm of mean
1 point sample:	≤5% or ±0.5 ppm of mean

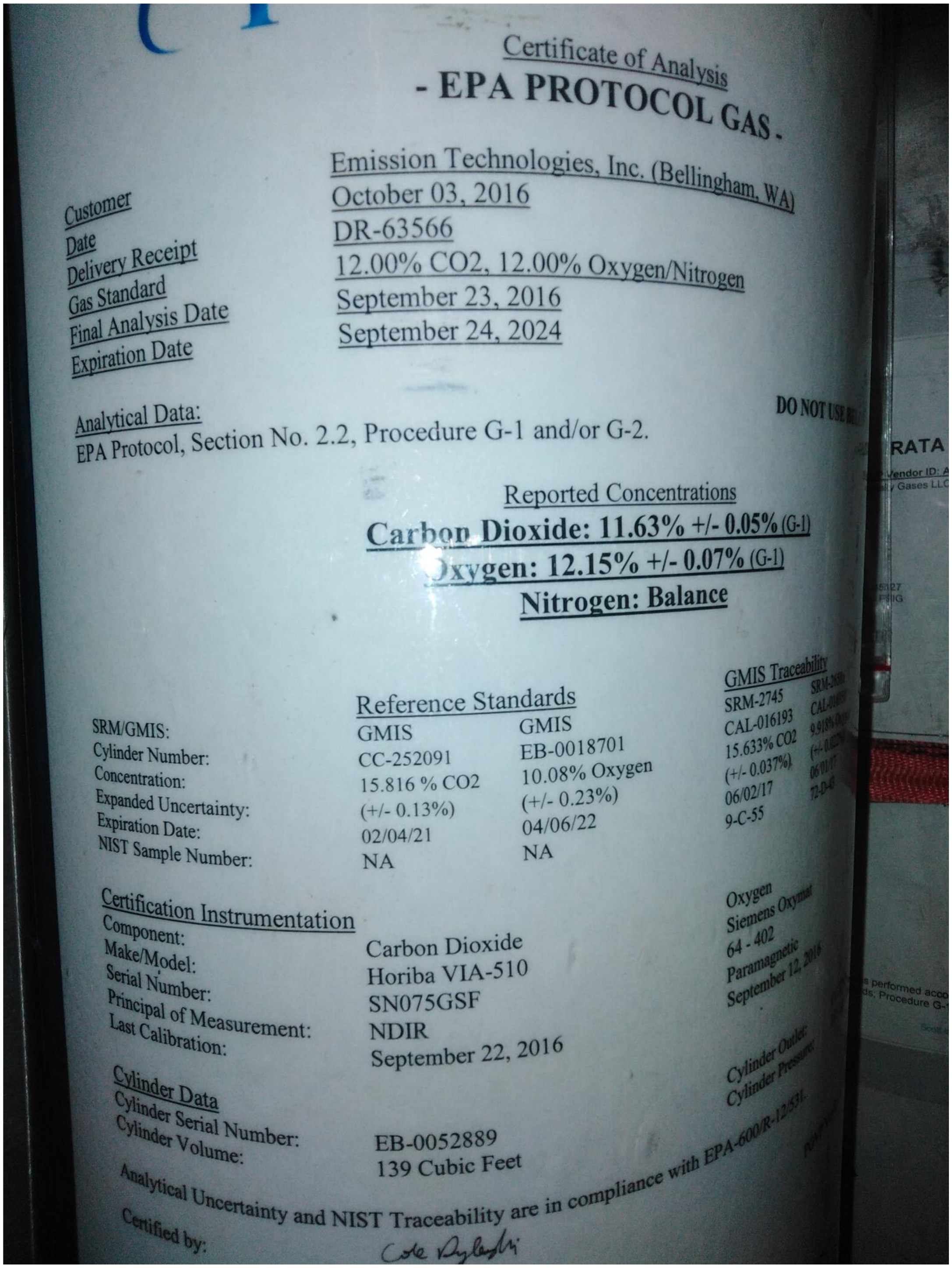
Number of Test Ports: 5
Stack Equivalent Diameter: (inches): 35
Port Length (inches): 5
# of Traverse Pts. (Gaseous): 1
# of Traverse Pts. (Particulates): 25
# of Traverse Pts. (Flows): 25

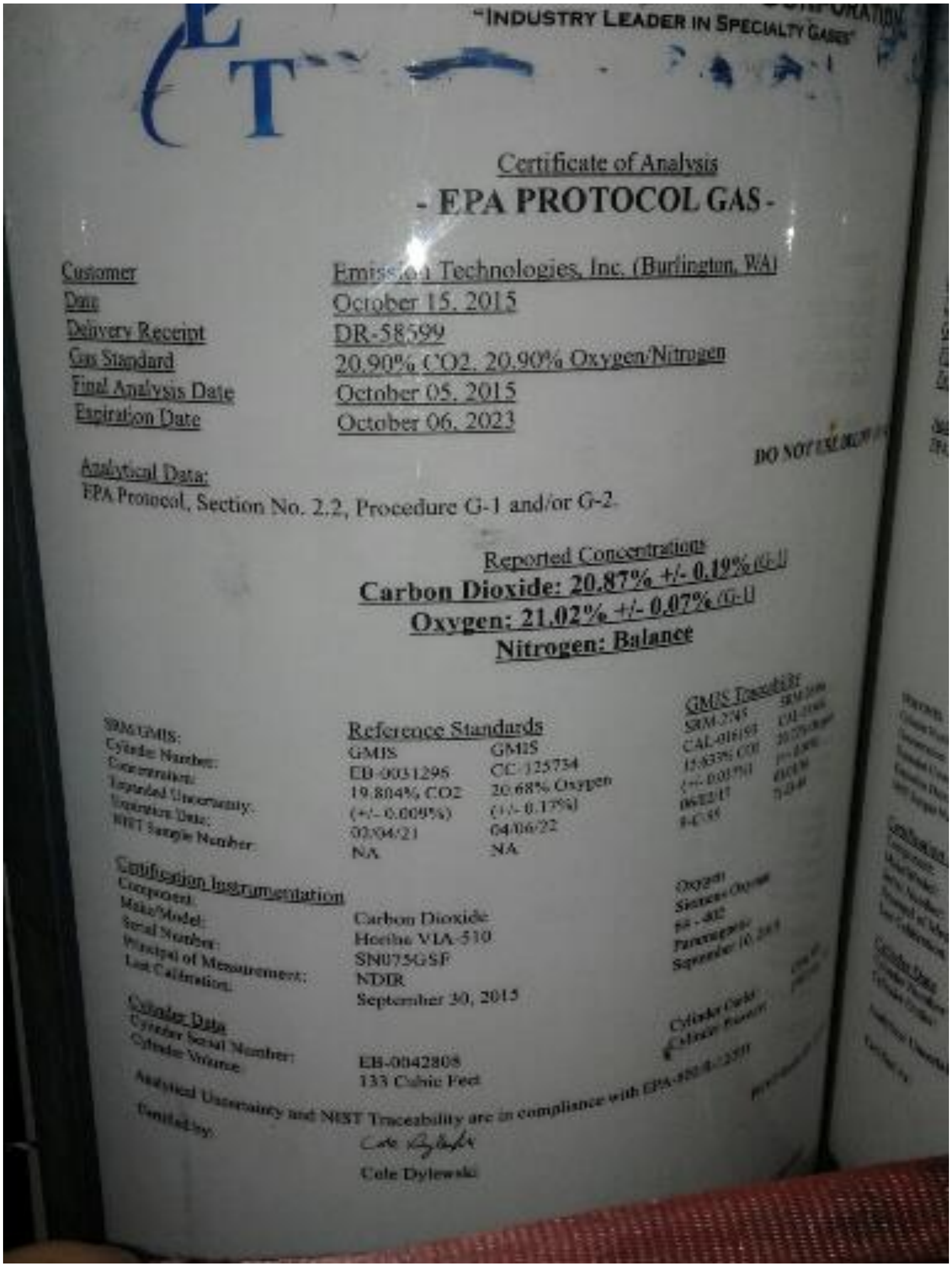


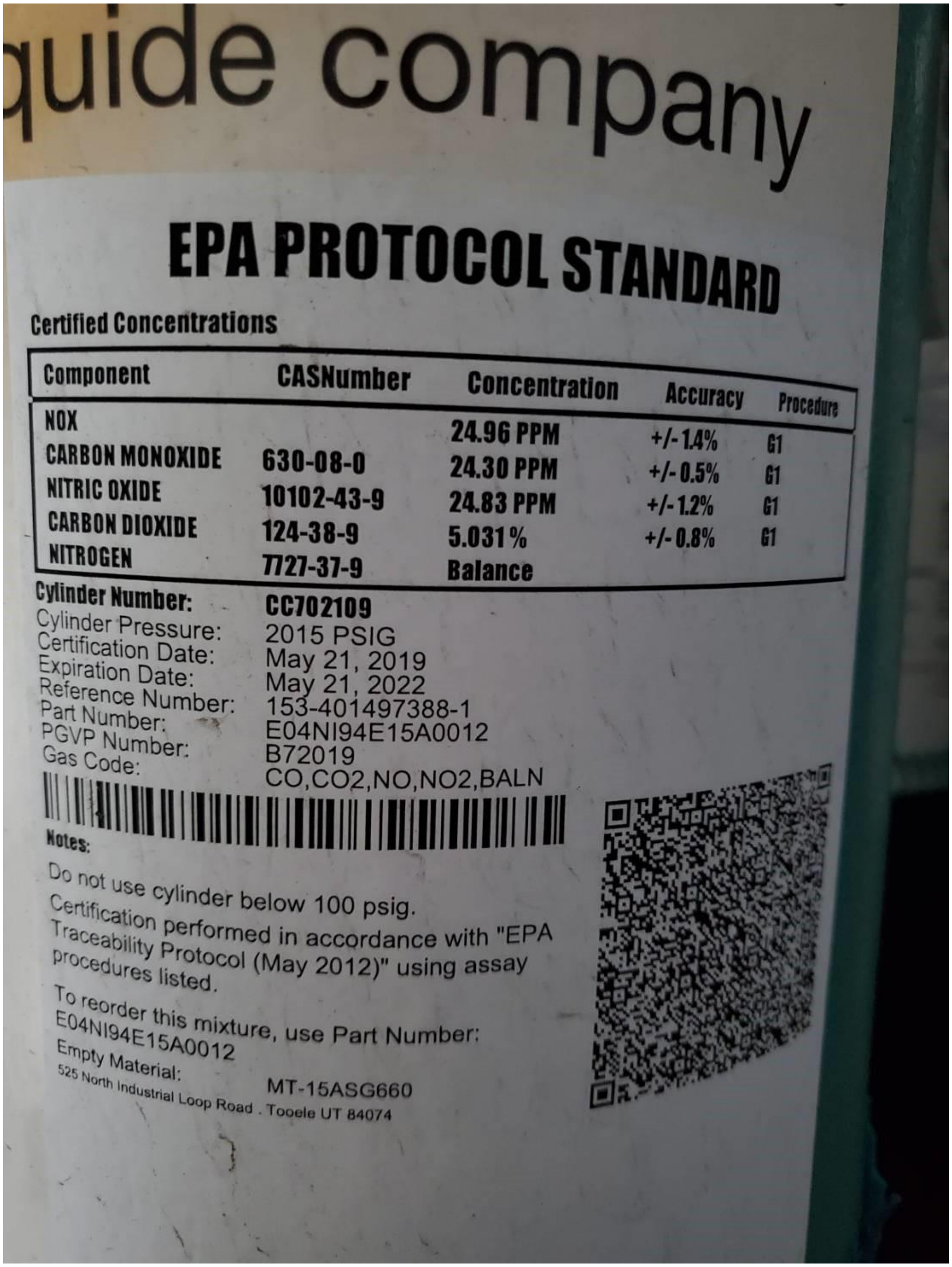
Distance Downstream From Flow Disturbance (inches): 108
Distance Upstream From Flow Disturbance (inches): 96
Stack Diameters Downstream: 3.1
Stack Diameters Upstream: 2.7

Cyclonic Flow: N
Does stack Meet EPA Method 1 Criteria? Y

6.4 Calibration Gas Certificates




"INDUSTRY LEADER IN SPECIALTY GASES"
Certificate of Analysis
- EPA PROTOCOL GAS -
Customer Emission Technologies, Inc. (Burlington, WA)
Date October 15, 2015
Delivery Receipt DR-58599
Gas Standard 20.90% CO2, 20.90% Oxygen/Nitrogen
Final Analysis Date October 05, 2015
Expiration Date October 06, 2023
DO NOT USE BELOW
Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1 and/or G-2.
Reported Concentrations
Carbon Dioxide: 20.87% +/- 0.19% (G-1)
Oxygen: 21.02% +/- 0.07% (G-1)
Nitrogen: Balance
Reference Standards
GMIS GMIS
EB-0031296 CC-125734
19.804% CO2 20.68% Oxygen
NA NA
Certification Instrumentation
Carbon Dioxide
NDIR
September 30, 2015
Cylinder Data
133 Cubic Feet
Cole Dylewski


quide company
EPA PROTOCOL STANDARD
Certified Concentrations
Component | CASNumber | Concentration | Accuracy | Procedure
NOX | | 24.96 PPM | +/- 1.4% | G1
CARBON MONOXIDE | 630-08-0 | 24.30 PPM | +/- 0.5% | G1
NITRIC OXIDE | 10102-43-9 | 24.83 PPM | +/- 1.2% | G1
CARBON DIOXIDE | 124-38-9 | 5.031% | +/- 0.8% | G1
NITROGEN | 7727-37-9 | Balance
Cylinder Number: CC702109
Cylinder Pressure: 2015 PSIG
Certification Date: May 21, 2019
Expiration Date: May 21, 2022
Reference Number: 153-401497388-1
Part Number: E04NI94E15A0012
PGVP Number: B72019
Gas Code: CO,CO2,NO,NO2,BALN
Notes:
Do not use cylinder below 100 psig.
Certification performed in accordance with "EPA Traceability Protocol (May 2012)" using assay procedures listed.
To reorder this mixture, use Part Number: E04NI94E15A0012
Empty Material: MT-15ASG660
525 North Industrial Loop Road . Tooele UT 84074

MATHESON
ask. . .The Gas Professionals™

1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: MATHESON TRI-GAS
510 53RD AVE E, STE #B
FIFE, WA 98424

Customer PO#: 1003
Protocol: G1
Part #: G2701119
Reference #: 756451-01
Lot#: 9309602869

Cylinder Number: SX63432
Cylinder Pressure: 1900 psig
Last Analysis Date: 10/8/2019
Expiration Date: 10/8/2027

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

		REPLICATE RESPONSES	
Component:	Sulfur Dioxide	Date: 10/1/2019	Date: 10/8/2019
Certified Conc:	52.10 ppm +/- 0.19 ppm ABS	52.15 52.16 52.16	51.93 52.07 52.12
Component:	Nitric Oxide	Date: 10/1/2019	Date: 10/8/2019
Certified Conc:	53.2 ppm +/- 0.2 ppm ABS	53.2 53.2 53.2	53.3 53.2 53.1
Component:	Carbon Monoxide	Date: 10/1/2019	
Certified Conc:	51.8 ppm +/- 0.2 ppm ABS	51.9 51.8 51.7	

NOx: 53.2 ppm REFERENCE ONLY

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Sulfur Dioxide	Nitric Oxide	Carbon Monoxide
Reference Standard:	PRM	PRM	NTRM
Cylinder #:	D506179	APEX1257585	ND22562
Concentration:	49.04ppm+/-0.15ppm (abs)	49.02ppm+/-0.20ppm (abs)	49.68ppm+/-0.25ppm (abs)
Exp. Date:	9/28/2020	5/24/2022	8/7/2021
SRM #:	VSL PRIMARY	VSL PRIMARY	NTRM
NIST Sample #:	VSL PRIMARY	VSL PRIMARY	151104

Component:	Sulfur Dioxide	Nitric Oxide	Carbon Monoxide
Make/Model:	HORIBA VIA-510	CAI 700	HORIBA VIA-510
Serial Number:	42321590023	1707006	ETYS79C6
Measurement Principle:	NDIR	CHEMI	NDIR
Last Calibration:	9/9/2019	9/9/2019	9/2/2019

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D62019, PGVP Participation Date: 01/01/19, PGVP Renewal Date: 01/01/20
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst: Cierra Freed
Cierra Freed

Date: 10/15/2019

Accredited by:
ANAB

ANAB ACCREDITED
ISO/IEC 17025
TESTING LABORATORY

6.5 NO_x Converter Check

EPA Method 7E - NOx Analyzer Converter Efficiency Check

Make:	HORIBA	**Date:**	10/08/20
Model:	PG-250	**Performed By:**	Rob Wilson
S/N:	6103006		

Zero NO Calibration Gas

Cylinder Conc.:	0.0 ppm	
Cylinder S/N:	EB47257	
Analyzer Response:	0.0 ppm	
ACE:	0.0% Eq. 7E-1	**PASS**

Mid NO Calibration Gas

Cylinder Conc.:	24.96 ppm	
Cylinder S/N:	CC702109	
Analyzer Response:	24.60 ppm	
ACE:	-0.7% Eq. 7E-1	**PASS**

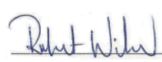
High NO Calibration Gas

Cylinder Conc.:	53.2 ppm	
Cylinder S/N:	SX63432	
Analyzer Response:	53.1 ppm	
ACE:	-0.19% Eq. 7E-1	**PASS**

NO_2 Calibration Gas

Cylinder Conc.:	45.5 ppm	
Cylinder S/N:	CC509578	
Analyzer Response:	43.4 ppm	
Converter Efficiency:	95.4% Eq. 7E-7	**PASS**

I certifiy that the above listed analyzer meets the requirements set forth in EPA Method 7E for converting NO_2 to NO.

Signature: 

6.6 Meter Calibrations

Pre-Test Meter Calibration

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

Quality - Service - Reliability

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE: 8/22/2020 METER SERIAL #: L001 BAROMETRIC PRESSURE (in Hg): INITIAL 29.81 FINAL 29.81 AVG (P_{bar}) 29.81

METER PART #: HF-L CRITICAL ORIFICE SET SERIAL #: 1543s

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS FINAL	NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
19	1	0.5079	16	946.768	952.325	5.557	58	56	58	57	59	57.5	8.5	1.4	5.6695	5.6562	0.998		1.81
19	2	0.5079	16	952.325	957.872	5.547	58	58	59	59	61	59.3	8.5	1.4	5.6403	5.6562	1.003		1.81
19	3	0.5079	16	957.872	963.420	5.548	58	59	60	61	63	60.8	8.5	1.4	5.6250	5.6562	1.006		1.80
																AVG =	1.002	-0.49	
16	1	0.4313	16	963.650	969.150	5.500	59	60	62	63	64	62.3	9.9	1.0	5.5549	5.5889	1.006		1.78
16	2	0.4313	16	969.150	974.760	5.610	59	62	63	64	65	63.5	10.1	1.0	5.6524	5.7018	1.009		1.78
16	3	0.4313	16	974.760	980.355	5.595	59	63	63	65	65	64.0	10.1	1.0	5.6319	5.7018	1.012		1.78
																AVG =	1.009	0.21	
11	1	0.3177	16	980.827	986.30	5.473	61	63	64	65	66	64.5	13.4	0.6	5.4978	5.5615	1.012		1.80
11	2	0.3177	16	986.30	991.785	5.485	61	64	65	67	67	65.8	13.4	0.6	5.4967	5.5615	1.012		1.80
11	3	0.3177	16	991.785	997.350	5.565	61	65	65	67	68	66.3	13.5	0.6	5.5716	5.6030	1.006		1.80
																AVG =	1.010	0.27	

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.007

AVERAGE $\Delta H_@$ = 1.80

$$\Delta H_@ = \left(\frac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H \left(\frac{V_m(std)}{V_m}\right)$$

(1) $$Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm}$$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $$Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}}$$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $$Y = \frac{Vcr_{(std)}}{Vm_{(std)}}$$ = DGM calibration factor

Post-Test Meter Calibration

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

Quality - Service - Reliability

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE: 10/8/2020 | METER PART #: HF-L | METER SERIAL #: L001 | CRITICAL ORIFICE SET SERIAL #: 1543s

BAROMETRIC PRESSURE (in Hg): INITIAL 29.72 | FINAL 29.72 | AVG (P_{bar}) 29.72

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS FINAL	NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
11	1	0.3177	18	980.827	986.900	6.073	57	56	57	55	55	55.8	15.0	0.6	6.1853	6.2308	1.007		1.83
11	2	0.3177	18	986.90	992.965	6.065	57	57	59	55	57	57.0	15.0	0.6	6.1622	6.2308	1.011		1.82
11	3	0.3177	18	992.965	999.020	6.055	58	59	60	57	58	58.5	15.0	0.6	6.1343	6.2248	1.015		1.82
																AVG =	1.011	0.00	

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.011

AVERAGE $\Delta H_@$ = 1.82

(1) $$Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm}$$
= Net volume of gas sample passed through DGM, corrected to standard conditions
K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$\Delta H_@ = \left(\frac{0.75\ \theta}{V_{cr}(std)}\right)^2 \Delta H \left(\frac{V_m(std)}{V_m}\right)$$

(2) $$Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}}$$
= Volume of gas sample passed through the critical orifice, corrected to standard conditions
T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)
K' = Average K' factor from Critical Orifice Calibration

(3) $$Y = \frac{Vcr_{(std)}}{Vm_{(std)}}$$
= DGM calibration factor

END OF TEST REPORT

APPENDIX D. EMISSION CALCULATIONS

Table 1. Facility-Wide Emissions Summary

Source	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_x (tpy)	VOC (tpy)	CO (tpy)	Combined HAPs (tpy)	Maximum Individual HAP (tpy)
Stack Emissions								
Aggregate Dryer	1.56	1.53	0.46	3.47	0.82	20.54	0.76	0.27
HMA Silo Filling [1]	--	--	--	--	1.22	--	0.02	8.41E-03
Asphalt Tanks	8.14E-04	8.14E-04	--	--	0.04	3.78E-03	5.90E-04	2.70E-04
Total Stack Emissions	*1.56*	*1.53*	*0.46*	*3.47*	*2.08*	*20.54*	*0.78*	*0.28*
Fugitive Emissions								
Load-Out [2]	0.03	0.03	--	--	0.13	--	0.00	6.59E-05
Haul Roads	0.08	0.02	--	--	--	--	--	--
Storage Pile Drop Points	0.21	0.03	--	--	--	--	--	--
Storage Pile Wind Erosion	0.06	0.01	--	--	--	--	--	--
Total Fugitive Emissions	*0.39*	*0.10*	--	--	*0.13*	--	*0.00*	*6.59E-05*
Total	**1.95**	**1.63**	**0.46**	**3.47**	**2.20**	**20.54**	**0.78**	**0.28**
Title V Major Source Threshold	100	100	100	100	100	100	25	10
Below Title V Major Source Threshold?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Asphalt storage silos are controlled by the baghouse. Therefore, PM_{10} and $PM_{2.5}$ emissions from silo filling are not calculated separately.

[2] Load-out PM_{10} and $PM_{2.5}$ emissions are conservatively assumed equivalent to load-out total PM emissions.

Table 2. Production and Equipment Capacities

Parameter		Value
Asphalt production rate [1]	(pre-project)	177,348 tons/yr
Asphalt maximum production rate	(post-project)	200 tons/hr
Asphalt production rate	(post-project)	200,000 tons/yr
NG burner capacity		100 MMBtu/hr
Exhaust flow capacity		18,832 dscfm
Exhaust temperature		190 degrees F
Exhaust oxygen percentage		14.7 %
Baghouse exit concentration (filterable)		0.0013 gr/dscf
Baghouse exit concentration (condensable)		0.0039 gr/dscf
Maximum Hours of Operation		4,380 hours/year

[1] Due to changes in ownership, Cadman only has data on historical production back to 2006. Production in the earlier part of this date range is nearer to the time of the burner replacement that began the replacement activities that require this application. For this reason, the earliest two-year period of production (i.e., 2006 and 2007) is used to establish the baseline production for determining the emission increase from the replacement.

[2] Exhaust flow rate and temperature are obtained from the stack test conducted on October 1, 2020. Baghouse exit concentrations obtained from stack test as well with the following safety factor:

1.3

Table 3. Aggregate Dryer Emissions - Criteria Pollutants

Pollutant	Emission Factor	Units	Emissions (lb/hr)	Emissions (tpy) [1]
PM (filterable)	0.0013	gr/dscf	0.21	0.46
PM (condensable)	0.0039	gr/dscf	0.63	1.38
PM_{10} [2]	0.004	gr/dscf	0.71	1.56
$PM_{2.5}$ [2]	0.004	gr/dscf	0.70	1.53
SO_2 [3]	0.0046	lb/ton	0.92	0.46
NO_x [4]	32.0	ppmdv @ 7% O_2	1.59	3.47
VOC [3]	0.0082	lb/ton	1.64	0.82
CO [4]	311.0	ppmdv @ 7% O_2	9.38	20.54
CO_2e [5]	--	--	11710	25644
CO_2 [6]	116.98	lb/MMBtu	11698	25618
CH_4 [6]	0.002	lb/MMBtu	0.2	0.48
N_2O [6]	0.0002	lb/MMBtu	0.02	0.05

[1] Note that annual emission rate estimates for pollutants with emissions based on exhaust flow (i.e., particulate, NOx and CO) are conservatively high compared to pollutants with emissions based on tonnage of product. The difference results from the fact that calculations based on flow rate do not account for the reduced flow that occurs when the dryer operates below its maximum capacity, and thus overestimate emissions.

[2] Particle size distribution for dust emissions from batch mix dryer controlled by fabric filter are obtained from AP-42 Chapter 11.1, Table 11.1-2.

PM_{10} 39%

$PM_{2.5}$ 33%

[3] Emission factors obtained from AP-42 Chapter 11.1, Tables 11.1-5 and 11.1-6 for emissions from a batch mix dryer with a natural gas-fired dryer.

[4] Emission factors for NO_x and CO are based on BACT limits of 32 and 311 ppm, respectively, corrected to 7% O_2.

[5] The GHG emissions are calculated based on the Global Warming Potentials (GWP) provided in Table A-1 of 40 CFR 98.

CO_2	1
CH_4	25
N_2O	298

[6] The natural gas emission factors are obtained from 40 CFR 98 Subpart C, Tables C-1 and C-2, and converted to values in lb/MMBtu.

Table 4. Aggregate Dryer TAP Emissions

Pollutant	CAS No.	HAP?	TAP?	Emission Factor[1] (lb/ton)	Pre-Project Dryer Emissions (tpy)	Post-Project Dryer Emissions (lb/hr)	Post-Project Dryer Emissions (tpy)	Emission Increase (tpy)	Averaging Period	SQER (lb/averaging period)	Project Emissions Increase [2] (lb/averaging period)	Modeling Required?
2-Methylnaphthalene	91-57-6	Yes - PAH	No	7.1E-05	6.30E-03	1.42E-02	7.10E-03	8.04E-04	--	--	--	--
Acenaphthene	83-32-9	Yes - PAH	No	9.0E-07	7.98E-05	1.80E-04	9.00E-05	1.02E-05	--	--	--	--
Acenaphthylene	208-96-8	Yes - PAH	No	5.8E-07	5.14E-05	1.16E-04	5.80E-05	6.57E-06	--	--	--	--
Acetaldehyde	75-07-0	Yes	Yes	3.2E-04	2.84E-02	0.06	0.03	3.62E-03	year	6.00E+01	7.25E+00	No
Anthracene	120-12-7	Yes - PAH	No	2.1E-07	1.86E-05	4.20E-05	2.10E-05	2.38E-06	--	--	--	--
Benzene	71-43-2	Yes	Yes	2.8E-04	2.48E-02	0.06	0.03	3.17E-03	year	2.10E+01	6.34E+00	No
Benzo(a)anthracene	56-55-3	Yes - PAH	Yes	4.6E-09	4.08E-07	9.20E-07	4.60E-07	5.21E-08	year	8.90E-01	1.04E-04	No
Benzo(a)pyrene	50-32-8	Yes - PAH	Yes	3.1E-10	2.75E-08	6.20E-08	3.10E-08	3.51E-09	year	1.60E-01	7.02E-06	No
Benzo(b)fluoranthene	205-99-2	Yes - PAH	Yes	9.4E-09	8.34E-07	1.88E-06	9.40E-07	1.06E-07	year	8.90E-01	2.13E-04	No
Benzo(g,h,i)perylene	191-24-2	Yes - PAH	No	5.0E-10	4.43E-08	1.00E-07	5.00E-08	5.66E-09	--	--	--	--
Benzo(k)fluoranthene	207-08-9	Yes - PAH	Yes	1.3E-08	1.15E-06	2.60E-06	1.30E-06	1.47E-07	year	8.90E-01	2.94E-04	No
Chrysene	218-01-9	Yes - PAH	Yes	3.8E-09	3.37E-07	7.60E-07	3.80E-07	4.30E-08	year	8.90E+00	8.61E-05	No
Dibenz(a,h)anthracene	53-70-3	Yes - PAH	Yes	9.5E-11	8.42E-09	1.90E-08	9.50E-09	1.08E-09	year	8.20E-02	2.15E-06	No
Ethyl Benzene	100-41-4	Yes	Yes	2.2E-03	1.95E-01	0.44	0.22	2.49E-02	year	6.50E+01	4.98E+01	No
Fluoranthene	206-44-0	Yes - PAH	No	1.6E-07	1.42E-05	3.20E-05	1.60E-05	1.81E-06	--	--	--	--
Fluorene	86-73-7	Yes - PAH	No	1.6E-06	1.42E-04	3.20E-04	1.60E-04	1.81E-05	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	7.4E-04	6.56E-02	0.15	0.07	8.38E-03	year	2.70E+01	1.68E+01	No
Indeno(1,2,3-cd)pyrene	193-39-5	Yes - PAH	Yes	3.0E-10	2.66E-08	6.00E-08	3.00E-08	3.40E-09	year	8.90E-01	6.80E-06	No
Naphthalene	91-20-3	Yes - PAH	Yes	3.6E-05	3.19E-03	7.20E-03	3.60E-03	4.08E-04	year	4.80E+00	8.15E-01	No
Phenanthrene	85-01-8	Yes - PAH	No	2.6E-06	2.31E-04	5.20E-04	2.60E-04	2.94E-05	--	--	--	--
Pyrene	129-00-0	Yes - PAH	No	6.2E-08	5.50E-06	1.24E-05	6.20E-06	7.02E-07	--	--	--	--
Quinone	106-51-4	Yes	No	2.7E-04	2.39E-02	0.05	0.03	3.06E-03	--	--	--	--
Toluene	108-88-3	Yes	Yes	1.0E-03	8.87E-02	0.20	0.10	1.13E-02	24-hr	3.70E+02	0	No
Xylene, mixed or all isomers	1330-20-7	Yes	Yes	2.7E-03	2.39E-01	0.54	0.27	3.06E-02	24-hr	1.60E+01	0	No
Arsenic	7440-38-2	Yes	Yes	4.6E-07	4.08E-05	9.20E-05	4.60E-05	5.21E-06	year	4.90E-02	1.04E-02	No
Barium	7440-39-3	No	No	1.5E-06	1.33E-04	3.00E-04	1.50E-04	1.70E-05	--	--	--	--
Beryllium	7440-41-7	Yes	Yes	1.5E-07	1.33E-05	3.00E-05	1.50E-05	1.70E-06	year	6.80E-02	3.40E-03	No
Cadmium	7440-43-9	Yes	Yes	6.1E-07	5.41E-05	1.22E-04	6.10E-05	6.91E-06	year	3.90E-02	1.38E-02	No
Chromium	7440-47-3	Yes	Yes	5.7E-07	5.05E-05	1.14E-04	5.70E-05	6.46E-06	24-hr	3.70E-01	0	No
Hexavalent Chromium	18540-29-9	Yes	Yes	4.8E-08	4.26E-06	9.60E-06	4.80E-06	5.44E-07	year	6.50E-04	1.09E-03	Yes
Copper	7440-50-8	No	Yes	2.8E-06	2.48E-04	5.60E-04	2.80E-04	3.17E-05	1-hr	1.90E-01	0	No
Lead	7439-92-1	Yes	Yes	8.9E-07	7.89E-05	1.78E-04	8.90E-05	1.01E-05	year	1.40E+01	2.02E-02	No
Manganese	7439-96-5	Yes	Yes	6.9E-06	6.12E-04	1.38E-03	6.90E-04	7.82E-05	24-hr	2.20E-02	0	No
Mercury	7439-97-6	Yes	Yes	4.1E-07	3.64E-05	8.20E-05	4.10E-05	4.64E-06	24-hr	2.20E-03	0	No
Nickel	7440-02-0	Yes	Yes	3.0E-06	2.66E-04	6.00E-04	3.00E-04	3.40E-05	year	6.20E-01	6.80E-02	No
Selenium	7782-49-2	Yes	Yes	4.9E-07	4.35E-05	9.80E-05	4.90E-05	5.55E-06	24-hr	1.50E+00	0	No
Zinc	7440-66-6	No	No	6.8E-06	6.03E-04	1.36E-03	6.80E-04	7.70E-05	--	--	--	--
				Total HAP:	**0.68**	**1.53**	**0.76**	**0.09**				
SO_2	7446-09-5	No	Yes	4.6E-03	4.08E-01	9.20E-01	4.60E-01	5.21E-02	1-hr	1.20E+00	0	No
NO_x	10102-44-0	No	Yes	--	3.47E+00	1.59E+00	3.47E+00	0.00E+00	1-hr	8.70E-01	0	No
CO	630-08-0	No	Yes	--	2.05E+01	9.38E+00	2.05E+01	0.00E+00	1-hr	4.30E+01	0	No

[1] Speciated emission factors for emissions from the dryer are obtained from U.S. EPA, Hot Mix Asphalt Plants, AP-42 Section 11.1, March 2004, Tables 11.1-9 and 11.1-11. Emission factors for natural gas-fired dryer with fabric filter for batch hot mix asphalt plants are used. Emissions of criteria pollutants that are also TAPs are based on the calculation shown in Table 2.

[2] For TAPs with short-term averaging periods (i.e., 1-hour and 24-hour), there is no increase in emissions from the project.

Table 5. HMA Silo Filling VOC Emissions

Emission unit	EF[1] (lb/ton)	Maximum Production (tons/hr)	Maximum Production (tons/yr)	VOC Emissions[2] (lb/hr)	VOC Emissions[2] (tpy)
HMA Silos	0.0122	200	200,000	2.44	1.22

[1] Emission factors calculated per AP-42 Table 11.1-14 for HMA load-out and silo filling operations.

E (lb/ton HMA) = $0.0504 * -V * e^{((0.0251) * (T + 460) - 20.43)}$

-0.5 = V, % loss-on-heating. Default value from footnote a to AP-42 Table 11.1-14 is used.

325 = T, °F HMA Mix Temperature. Asphalt temperature exiting the drum mixer is approximately 350 °F. It is assumed that the asphalt cools to 325°F prior to entering the silo.

[2] Per AP-42 Table 11.1-16, 100% of TOC from HMA silo filling is VOC.

Table 6. Asphalt Silos Speciated HAP and TAP Emissions

Substance	CAS No.	Speciation Profile[1]	HAP?	TAP?	Emission Rate[2] (lb/hr)	Emission Rate[2] (tpy)
Organic Volatile-Based Compounds						
Benzene	71-43-2	0.0320%	Yes	Yes	7.80E-04	3.90E-04
Bromomethane	74-83-9	0.0049%	Yes	Yes	1.19E-04	5.97E-05
2-Butanone	78-93-3	0.0390%	Yes	Yes	9.51E-04	4.75E-04
Carbon Disulfide	75-15-0	0.0160%	Yes	Yes	3.90E-04	1.95E-04
Chloroethane	75-00-3	0.0040%	Yes	Yes	9.75E-05	4.87E-05
Chloromethane	74-87-3	0.0230%	Yes	Yes	5.61E-04	2.80E-04
Ethyl Benzene	100-41-4	0.0380%	Yes	Yes	9.26E-04	4.63E-04
Formaldehyde	50-00-0	0.6900%	Yes	Yes	1.68E-02	8.41E-03
Hexane, n-	110-54-3	0.1000%	Yes	Yes	2.44E-03	1.22E-03
Isooctane	540-84-1	0.0003%	Yes	No	7.56E-06	3.78E-06
Methylene Chloride	75-09-2	0.0003%	Yes	Yes	6.58E-06	3.29E-06
Styrene	100-42-5	0.0054%	Yes	Yes	1.32E-04	6.58E-05
Toluene	108-88-3	0.0620%	Yes	Yes	1.51E-03	7.56E-04
Xylene, mixed or all isomers[3]	1330-20-7	0.2570%	Yes	Yes	6.26E-03	3.13E-03
Total HAPs		**1.272%**			**0.03**	**0.02**

[1] Speciation profile from U.S. EPA, Hot Mix Asphalt Plants, AP-42 Section 11.1, March 2004, Table 11.1-16, excluding the species that are non-VOC or non-HAP. Particulate matter emissions are controlled by the baghouse; therefore, the emissions from controlled organic PM-based HAPs are assumed to be negligible.

[2] Volatile HAP emissions are determined based on the speciation data presented in AP-42 Table 11.1-16 and the VOC emissions calculated according to AP-42 Table 11.1-14.

[3] Emission factors for m-, o-, and p-xylene are combined.

Table 7. HMA Load-Out Criteria Pollutant Emissions

Pollutant	EF [1] (lb/ton)	Throughputs (tons/hr)	Throughputs (tons/yr)	Emissions (lb/hr)	Emissions (tpy)
PM - Batch Mix [2]	0.0003	160	160,000	2.33E-02	1.16E-02
PM - Silo 1 [2]	0.0003	20	20,000	5.82E-03	2.91E-03
PM - Silo 2 [2]	0.0003	20	20,000	5.82E-03	2.91E-03
VOC [3]	0.0013	200	200,000	0.25	0.13
CO	0.0004	200	200,000	0.09	0.04

[1] Emission factors calculated per AP-42 Table 11.1-14 for HMA load-out operations.

-0.5 = V, % loss-on-heating. Default value from footnote a to AP-42 Table 11.1-14 is used.

280 = T, °F HMA Mix Temperature, received from Cadman on September 23, 2021 via email.

[2] It is assumed that 80% of loadout operations happen at the batch mix loadout area and 10% occurs at each silo. The batch mix loadout area is controlled by a fugitive air fan that is routed to the baghouse as per email communication from Christy McDonough on September 24, 2021. Suction for batch mix loadout is available, but not fully enclosed. Therefore, a 50% capture efficiency is assumed for the batch mix loadout emissions.

[3] Per AP-42 Table 11.1-16, 94% of TOC from HMA load-out is VOC.

Table 8. Load-Out Speciated HAP and TAP Emissions

Substance	CAS No.	EF [1] (lb/ton)	Speciation Profile [1]	HAP?	TAP?	Emission Rate [2] (lb/hr)	Emission Rate [2] (tpy)
Organic PM		0.0001					
Acenaphthene	83-32-9		0.2600%	Yes	No	5.73E-06	2.86E-06
Acenaphthylene	208-96-8		0.0280%	Yes	No	6.17E-07	3.09E-07
Anthracene	120-1207		0.0700%	Yes	No	1.54E-06	7.71E-07
Benzo(a)anthracene	56-55-3		0.0190%	Yes	Yes	4.19E-07	2.09E-07
Benzo(b)fluoranthene	205-99-2		0.0076%	Yes	Yes	1.67E-07	8.37E-08
Benzo(k)fluoranthene	207-08-9		0.0022%	Yes	Yes	4.85E-08	2.42E-08
Benzo(g,h,i)perylene	191-24-2		0.0019%	Yes	No	4.19E-08	2.09E-08
Benzo(a)pyrene	50-32-8		0.0023%	Yes	Yes	5.07E-08	2.53E-08
Benzo(e)pyrene	192-97-2		0.0078%	Yes	No	1.72E-07	8.59E-08
Chrysene	218-01-9		0.1030%	Yes	Yes	2.27E-06	1.13E-06
Dibenz(a,h)anthracene	53-70-3		0.0004%	Yes	Yes	8.15E-09	4.08E-09
Fluoranthene	206-44-0		0.0500%	Yes	No	1.10E-06	5.51E-07
Fluorene	86-73-7		0.7700%	Yes	No	1.70E-05	8.48E-06
Indeno(1,2,3-cd)pyrene	193-39-5		0.0005%	Yes	Yes	1.04E-08	5.18E-09
2-Methylnaphthalene	91-57-6		2.3800%	Yes	No	5.25E-05	2.62E-05
Naphthalene	91-20-3		1.2500%	Yes	Yes	2.75E-05	1.38E-05
Perylene	198-55-0		0.0220%	Yes	No	4.85E-07	2.42E-07
Phenanthrene	85-01-8		0.8100%	Yes	No	1.79E-05	8.93E-06
Pyrene	129-00-0		0.1500%	Yes	No	3.31E-06	1.65E-06
Phenol	108-95-2		1.1800%	Yes	Yes	2.60E-05	1.30E-05
TOC		0.0013					
Benzene	71-43-2		0.0520%	Yes	Yes	1.40E-05	6.99E-06
Bromomethane	74-83-9		0.0096%	Yes	Yes	2.58E-06	1.29E-06
2-Butanone	78-93-3		0.0490%	Yes	Yes	1.32E-05	6.59E-06
Carbon Disulfide	75-15-0		0.0130%	Yes	Yes	3.49E-06	1.75E-06
Chloroethane	75-00-3		0.0002%	Yes	Yes	5.65E-08	2.82E-08
Chloromethane	74-87-3		0.0150%	Yes	Yes	4.03E-06	2.02E-06
Cumene	92-82-8		0.1100%	Yes	No	2.96E-05	1.48E-05
Ethylbenzene	100-41-4		0.2800%	Yes	Yes	7.53E-05	3.76E-05
Formaldehyde	50-00-0		0.0880%	Yes	Yes	2.37E-05	1.18E-05
Hexane, n-	100-54-3		0.1500%	Yes	No	4.03E-05	2.02E-05
Isooctane	540-84-1		0.0018%	Yes	No	4.84E-07	2.42E-07
Styrene	100-42-5		0.0073%	Yes	Yes	1.96E-06	9.81E-07
Tetrachloroethene	127-18-4		0.0077%	Yes	Yes	2.07E-06	1.03E-06
Toluene	100-88-3		0.2100%	Yes	No	5.65E-05	2.82E-05
Trichlorofluoromethane	75-69-4		0.0013%	Yes	No	3.49E-07	1.75E-07
Xylene, mixed or all isomers [4]	1330-20-7		0.4900%	Yes	Yes	1.32E-04	6.59E-05
Total HAPs			**8.600%**			**0.00**	**0.00**

[1] Emission factors calculated per AP-42 Table 11.1-14 for HMA load-out operations, using the same assumptions as the criteria pollutants (see table above).

[2] Speciation profile is obtained from Tables 11.1-15 and 11.1-16.

[3] Emission rates are based on the maximum hourly and annual production rates.

[4] Emission factors for m-, o-, and p-xylene are combined.

Table 9. Paved Road Emissions

Paved Truck Route	PM Emission Factor, E [1] (lb/VMT)	PM_{10} Emission Factor, E [1] (lb/VMT)	$PM_{2.5}$ Emission Factor, E [1] (lb/VMT)	Maximum Vehicles Per Hour [2]	Maximum Vehicles Per Year [2]	Truck Route Round Trip Distance (ft)	Vehicle Miles Traveled per Hour (VMT/hr)	Vehicle Miles Traveled per Year (VMT/yr)	PM Emissions [3] (lb/hr)	PM Emissions [3] (tpy)	PM_{10} Emissions [3] (lb/hr)	PM_{10} Emissions [3] (tpy)	$PM_{2.5}$ Emissions [3] (lb/hr)	$PM_{2.5}$ Emissions [3] (tpy)
HMA Truck Route	0.72	0.14	0.04	13.33	13,333	528	1.3	1,333	0.81	0.42	0.16	0.08	0.04	0.02

[1] Emission factor E is calculated according to AP-42 Section 13.2.1 for emissions from paved roads, equation 1:

E (lbs/VMT) = Hourly Paved Road Emission Factor, $[k * (sL)^{0.91} * (W)^{1.02}]$

0.011 = k, PM size multiplier (lb/VMT) from AP-42 Table 13.2.1-1.

0.0022 = k, PM_{10} size multiplier (lb/VMT) from AP-42 Table 13.2.1-1.

0.00054 = k, $PM_{2.5}$ size multiplier (lb/VMT) from AP-42 Table 13.2.1-1.

3 = sL, roadway surface silt loading (g/m^2) EPA Emission Assessment Report for HMA Plants (EPA 454/R-00-019)

22.5 = W, average truck weight (tons)

[2] Maximum vehicles per hour and maximum vehicles per year are based on truck capacity and maximum asphalt production values:

HMA Truck Capacity: 15 tons

Max Hourly Production: 200 tons/hr

Max Annual Production: 200,000 tons/yr

[3] Hourly and annual emissions account for natural mitigation due to precipitation according to AP-42 Section 13.2.1 equations 2 and 3:

Hourly emissions (lb/hr) = E * (1-1.2P/N) * VMT/hr

Annual emissions (tpy) = E * (1-P/4N) * VMT/yr

4 = P, minimum number of days per month with measurable precipitation for Seattle Area Station, NOAA Online Weather Data, NOWData tool, https://w2.weather.gov/climate/xmacis.php?wfo=sew

180 = P, mean number of days per year with measurable precipitation, AP-42 Figure 13.2.1-2.

744 = N, number of hours in period for hourly rainfall mitigation effect

365 = N, number of days in period for annual rainfall mitigation effect

Table 10. Aggregate Pile Material Handling

Pile	Maximum Throughput [1] (tons/hr)	Maximum Throughput [1] (tons/yr)	Total Pile Transfers [2]	PM Emissions [3] (lb/hr)	PM Emissions [3] (tpy)	PM_{10} Emissions [3] (lb/hr)	PM_{10} Emissions [3] (tpy)	$PM_{2.5}$ Emissions [3] (lb/hr)	$PM_{2.5}$ Emissions [3] (tpy)
Combined stockpiles	200	200,000	2	0.91	0.45	0.43	0.21	0.06	0.03

[1] Maximum hourly and annual throughputs are based on production rates specified in the "Dryer Emissions" tab.

[2] The calculations assume that all aggregate materials input to the plant will go through multiple material transfers before drying.

[3] Emissions calculated using emission factor determined according to AP-42 Section 13.2.4 for aggregate handling and storage piles.

E (lb/VMT) = $k (0.0032) \times (U/5)^{1.3}/(M/2)^{1.4}$

0.74 = k, PM size multiplier

0.35 = k, PM_{10} size multiplier

0.053 = k, $PM_{2.5}$ size multiplier

7.47 = U, mean wind speed (mph) (average from 2011-2015 at Snohomish County Airport (Paine Field))

3 = M, average moisture content of pile materials (actuals between 1-10%)

Table 11. Pile Wind Erosion

Pile	Area [1] (acres)	PM Emissions [2] (lb/hr)	PM Emissions [2] (tpy)	PM_{10} Emissions [3] (lb/hr)	PM_{10} Emissions [3] (tpy)	$PM_{2.5}$ Emissions [3] (lb/hr)	$PM_{2.5}$ Emissions [3] (tpy)
Combined stockpiles	0.5	0.03	0.12	0.01	0.06	0.00	0.01

[1] Pile area is estimated using Google Earth imagery. Footprint area is used to estimate the total exposed area.

[2] PM Emissions are calculated using emission factors determined according to Equation 2-12 from the EPA document "Fugitive Dust

e_{TSP} (lb/acre-day) = 1.7 * (s/1.5) * [(365-p) / 235] * (f/15)

1.6 = s, silt content obtained from AP-42 Table 13.2.4-1 (%) for crushed limestone as an estimate for aggregates

180 = p, number of days with > 0.01 in. precipitation per year

14.09 = f, percentage of time that the unobstructed wind speed exceeds 12 mph at the mean pile height (%) obtained from surface meteorological data from 2011-2015 at Snohomish County Airport (Paine Field).

[3] PM_{10} and $PM_{2.5}$ emissions are determined based on PM emissions using the ratios of the particle size multipliers for each particle size

Table 12. Asphalt Tank Criteria Pollutant Emissions

Pollutant	Emission Rate (tpy) Tank 1	Tank 2	Total
Organic PM [3]	5.77E-04	2.37E-04	8.14E-04
VOC [2]	0.03	1.14E-02	0.04
CO [3]	2.68E-03	1.10E-03	3.78E-03
Total HAP	4.18E-04	1.72E-04	5.90E-04

[1] Throughput for each tank is estimated to be:

Tank 1	8,792,217 gal/yr or	1,034,378 lb/yr
Tank 2	3,612,041 gal/yr or	424,946 lb/yr

[2] Tank VOC emissions are estimated using AP-42 Chapter 7.1. VOC emissions for each tank is estimated to be:

Tank 1	0.03 tpy
Tank 2	1.14E-02 tpy

[3] CO and Organic PM emission estimates calculated by using the ratio of coefficients for silo filling emissions to TOC from AP-42 as described in AP-42 Chapter 11.1. Coefficients obtained from Table 11.1-14.

[4] Previous Cadman emission calculations conservatively applied the total PM emission factor from AP-42 11.1-14 to tank emissions; however, this factor is intended for silo filling, which is not applicable to the tank emissions. In addition, the silo filling emissions are controlled by the baghouse. Since baghouse emissions are based on stack test data, the silo filling emissions should not be calculated separately for Cadman's Kenmore plant.

Table 13. Asphalt Tank Speciated HAP/TAP Emissions

Pollutant	CAS Number	HAP?	TAP? [3]	Compound/ Organic PM	Compound/ TOC	HAP Emissions (tpy)	TAP Emissions (tpy)
Acenaphthene [1]	83-32-9	Yes	No	0.47%	--	3.83E-06	--
Acenaphthylene [1]	208-96-8	Yes	No	0.01%	--	1.14E-07	--
Anthracene [1]	120-1207	Yes	No	0.13%	--	1.06E-06	--
Benzo(a)anthracene [1]	56-55-3	Yes	Yes	0.06%	--	4.56E-07	4.56E-07
Benzo(e)pyrene [1]	192-97-2	Yes	No	0.01%	--	7.73E-08	--
Chrysene [1]	218-01-9	Yes	Yes	0.21%	--	1.71E-06	1.71E-06
Fluoranthene [1]	206-44-0	Yes	No	0.15%	--	1.22E-06	--
Fluorene [1]	86-73-7	Yes	No	1.01%	--	8.22E-06	--
2-Methylnaphthalene [1]	91-57-6	Yes	No	5.27%	--	4.29E-05	--
Naphthalene [1]	91-20-3	Yes	Yes	1.82%	--	1.48E-05	1.48E-05
Perylene [1]	198-55-0	Yes	No	0.03%	--	2.44E-07	--
Phenanthrene [1]	85-01-8	Yes	No	1.80%	--	1.47E-05	--
Pyrene [1]	129-00-0	Yes	No	0.44%	--	3.58E-06	--
Benzene [2]	71-43-2	Yes	Yes	--	0.03%	1.25E-05	1.25E-05
Bromomethane [2]	74-83-9	Yes	Yes	--	0.00%	1.91E-06	1.91E-06
2-Butanone [2]	78-93-3	Yes	Yes	--	0.04%	1.52E-05	1.52E-05
Carbon Disulfide [2]	75-15-0	Yes	Yes	--	0.02%	6.25E-06	6.25E-06
Chloroethane [2]	75-00-3	Yes	Yes	--	0.00%	1.56E-06	1.56E-06
Chloromethane [2]	74-87-3	Yes	Yes	--	0.02%	8.99E-06	8.99E-06
Ethylbenzene [2]	100-41-4	Yes	Yes	--	0.04%	1.48E-05	1.48E-05
Formaldehyde [2]	50-00-0	Yes	Yes	--	0.69%	2.70E-04	2.70E-04
n-Hexane [2]	110-54-3	Yes	Yes	--	0.10%	3.91E-05	3.91E-05
Isooctane [2]	540-84-1	Yes	No	--	0.00%	1.21E-07	--
Methylene Chloride [2]	75-09-2	Yes	Yes	--	0.00%	1.06E-07	1.06E-07
Styrene [2]	100-42-5	Yes	Yes	--	0.01%	2.11E-06	2.11E-06
Toluene [2]	100-88-3	Yes	No	--	0.06%	2.42E-05	--
m-/p-Xylene [2]	1330-20-7	Yes	Yes	--	0.20%	7.82E-05	7.82E-05
o-Xylene [2]	95-47-6	Yes	Yes	--	0.06%	2.23E-05	2.23E-05
Total HAP						**5.90E-04**	

[1] Emission factors obtained from AP-42 Table 11.1-15. Emissions calculated by multiplying the parentage presented for the compound by the total emissions of Organic PM.

[2] Emission factors obtained from AP-42 Table 11.1-16. Emissions calculated by multiplying the parentage presented for the compound by the total emissions of VOC.

[3] TAPs are determined using WAC 173-460-150.

Table 14. CalPortland Emission Calculations

Equipment	Grain Loading [1] (gr/dscf)	Capacity (cfm)	PM Emissions [2] (lb/hr)	PM Emissions [2] (tpy)	PM_{10} Emissions [3] (lb/hr)	PM_{10} Emissions [3] (tpy)	PM2.5 Emissions [4] (lb/hr)	PM2.5 Emissions [4] (tpy)
Silo 1 Baghouse	0.0013	2340	0.03	0.06	8.95E-03	1.96E-02	1.44E-03	3.16E-03
Silo 2 Baghouse	0.0013	2340	0.03	0.06	8.95E-03	1.96E-02	1.44E-03	3.16E-03
Silo 3 Baghouse	0.0013	2340	0.03	0.06	8.95E-03	1.96E-02	1.44E-03	3.16E-03
Load Out Baghouse	0.0013	7500	0.08	0.18	2.87E-02	6.29E-02	4.63E-03	1.01E-02
Sock Filter	--	--	5.50E-04	1.20E-03	2.75E-04	4.13E-04	4.43E-05	6.67E-05
		Total	**0.16**	**0.36**	**0.06**	**0.12**	**0.01**	**0.02**

[1] Grain loading and capacity data obtained from the following NOC worksheets:

NOC 9558: Silo 1 baghouse, silo 2 baghouse, silo 3 baghouse

NOC 9819: Load out baghouse. NOC worksheet lists grain loading for the loadout baghouse of 0.01 gr/dscf. Confirmation was received from PSCAA via phone call (Brian Renninger on September 15, 2021) that the grain loading of 0.0013 gr/dscf is acceptable. This level is consistent with the permit limits based on the BAAQMD BACT database for all except one baghouse and is conservative compared to testing PSCAA has reviewed for concrete batch plants.

[2] Operations are assumed to be during daylight hours (conservatively 6am - 6pm) 4,380 hours/year.

[3] PM_{10} emissions based on proportion of PM_{10} to PM in AP-42 in Table 11.12-2 consistent with emission calculations in NOC Worksheet 12140.

[4] $PM_{2.5}$ emissions based on proportion of $PM_{2.5}$ to PM_{10} in AP-42 Table 11.12-3 consistent with emission calculations in NOC Worksheet 12140.

[5] PM emissions for the sock filter are based on the maximum PM emissions from one baghouse unit and the uncontrolled emission factor ratio of weigh hopper loading to cement unloading to storage silos in AP-42 Table 11.12-2.