AIR TOXICS HEALTH RISK ASSESSMENT
ECOSERVICES SCAQMD FACILITY ID NO. 180908

Prepared for
Ecoservices Operations Corporation

February 2022

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DEFINITIONS

Air Toxics Health Risk Assessment

Acute Health Impacts: non-cancer health impacts for short-term, one-hour peak exposures to potential Facility emissions. Acute Reference Exposure Levels (RELs), which are used to calculate acute non-cancer hazards, are developed to represent an exposure that is not likely to cause adverse health effects in a human population, included sensitive subgroups, exposed to that concentration for the specified exposure duration on an intermittent basis.

Chronic Health Impacts: non-cancer health impacts from long-term exposure to potential Facility emissions. Chronic RELs, which are used to calculate chronic non-cancer hazards, are developed to represent the level at or below which no adverse health effects are anticipated following long-term exposure. Long-term exposure for these purposes has been defined as 12% of a lifetime, or about eight years for humans.

8-Hour Health Impacts: non-cancer health impacts for exposures that occur on a recurrent basis, but only during a portion of each day. The 8-hour RELs are designed to protect against periodic exposure that could occur as often as daily and may share characteristics of both acute and chronic exposure. These RELs were developed because of concerns that applying the chronic REL in some scenarios was overly conservative. By definition, an 8-hour REL is an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration for an 8-hour exposure duration on a regular (including daily) basis.

Cancer Health Impacts: carcinogenic risks estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to carcinogens potentially present in Facility emissions. Cancer inhalation and oral potency factors, which are used to calculate cancer risk, are expressed as the upper bound of probability of developing cancer assuming continuous lifetime exposure to a substance at a dose of one milligram per kilogram of body weight. It is assumed in cancer risk assessments that risk is directly proportional to dose and that there is no threshold for carcinogenesis. The derivation of carcinogenic inhalation and oral cancer potency factors takes into account the available information on pharmacokinetics and on the mechanism of carcinogenic action. These values are generally the 95% upper confidence limit (UCL) on the dose-response slope.

ABBREVIATIONS
Air Toxics Health Risk Assessment

AB: Assembly Bill

AERMOD: American Meteorological Society/Environmental Protection Agency regulatory air dispersion model

ATIR: Air Toxics Inventory Report

Cal/EPA: California Environmental Protection Agency

CARB: California Air Resources Board

CPF: Cancer Potency Factor

GLC: Ground-Level Concentration

HARP: Hotspots Analysis and Reporting Program

HI: Hazard Index

HQ: Hazard Quotient

HRA: Health Risk Assessment

LTN: Long Ton

MEIR: Maximally Exposed Individual Resident

MEIW: Maximally Exposed Individual Worker

MEISR: Maximally Exposed Individual Sensitive Receptor

MICR: Maximum Individual Cancer Risk

MSDS: Material Safety Data Sheet

NED: National Elevation Dataset

NWS: National Weather Service

OEHHA: Office of Environmental Health Hazard Assessment

PMI: Point of Maximum Impact

REL: Reference Exposure Levels

RRP: Risk Reduction Plan

SCAQMD: South Coast Air Quality Management District

TAC: Toxic Air Contaminant

U.S. EPA: United States Environmental Protection Agency

USGS: United States Geological Survey

UTM: Universal Transverse Mercator

WGS: World Geodetic System

South Coast Air Quality Management District
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HEALTH RISK ASSESSMENT SUMMARY FORM

(Required in Executive Summary of HRA)

Facility Name : Ecoservices Operations Corp
Facility Address: 20720 S, Wilmington Ave.
Long Beach , CA 90810
Type of Business: Sulfuric Acid Manufacturing
SCAQMD ID No.: 180908

A. Cancer Risk

(One in a million means one chance in a million of getting cancer from being constantly exposed to a certain level of a chemical over a period of time)

1. Inventory Reporting Year : 2017
2. Maximum Cancer Risk to Receptors : *(Offsite and residence = 30-year exposure, worker = 25-year exposure)*
   a. Offsite 0.03 in a million Location:
   b. Residence 0.06 in a million Location:
   c. Worker 0.03 in a million Location:
3. Substances Accounting for 90% of Cancer Risk: PAH, Perchloroethylene
   Processes Accounting for 90% of Cancer Risk: Soil Vapor Extraction System, Acid Plant NG Burners
4. Cancer Burden for a 70-yr exposure: *(Cancer Burden = [cancer risk] x [# of people exposed to specific cancer risk])*
   a. Cancer Burden: NA
   b. Number of people exposed to >1 per million cancer risk for a 70-yr exposure: NA
   c. Maximum distance to edge of 70-year, 1 x 10^{-6} cancer risk isopleth (meters): NA

B. Hazard Indices

[Long Term Effects (chronic) and Short Term Effects (acute)]
(non-carcinogenic impacts are estimated by comparing calculated concentration to identified Reference Exposure Levels, and expressing this comparison in terms of a "Hazard Index")

1. Maximum Chronic Hazard Indices:
   a. Residence HI: 0.07 Location: 385800 E 3745950 N toxicological endpoint: Respiratory
   b. Worker HI : 0.15 Location: 385900 E 3745700 N toxicological endpoint: Respiratory
2. Substances Accounting for 90% of Chronic Hazard Index: sulfuric acid
3. Maximum 8-hour Chronic Hazard Index:
   8-Hour Chronic HI: 3.8E-5 Location: 386089 E 3745344 N toxicological endpoint: Blood
4. Substances Accounting for 90% of 8-hour Chronic Hazard Index: Benzene
5. Maximum Acute Hazard Index:
   PMI: 1.64 Location: 85734 E 3745469 N toxicological endpoint: Central Nervous System
6. Substances Accounting for 90% of Acute Hazard Index: Hydrogen Sulfide

C. Public Notification and Risk Reduction

1. Public Notification Required? X Yes ____ No
   a. If 'Yes', estimated population exposed to risks > 10 in a million for a 30-year exposure, or an HI >1
   0
2. Risk Reduction Required? ____ Yes X No

ECOSERVICES SCAQMD FACILITY ID NO. 180908

Air Toxics Health Risk Assessment

1.0 Executive Summary

Introduction

On December of 2020, the South Coast Air Quality Management District (SCAQMD) sent a letter to Ecoservices Operations Corporation (Ecoservices, SCAQMD Facility ID No. 180908) identifying it as a Potentially High-Risk Facility under Rule 1402. As a Potentially High-Risk Facility, Ecoservices is required to prepare a health risk assessment consistent with SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines. This document was prepared with content requirements specified in Appendix B - Outline for the HRA. Tables and figures supporting the health risk assessment report can be viewed in **Appendix A and B** of this document.

Ecoservices is a manufacturer located at 20720 South Wilmington Avenue in the City of Carson. Ecoservices produces two main product lines in their Dominguez facility: sulfuric acid and aluminum sulfate. A vicinity map for the facility is provided in **Figure ES-1.**

Facility Operations and Emission Sources

Sulfuric acid is the largest volume chemical manufactured in the United States and is used in many industries. The largest volume sulfuric acid customers for the Dominguez Plant are refineries who use sulfuric acid as a catalyst in their alkylation process. The aluminum sulfate solution is used primarily in the water treatment and paper manufacturing industries.

Onsite sources of emissions in the Dominguez Plant include the acid plant furnace, startup heater and package boiler, non-refinery flare, sulfur unloading and Soil Vapor Extraction (SVE) systems, and diesel air compressor, as well as a variety of space and comfort heaters. A site plot plan with sources and buildings identified is provided in **Figure ES-2**. Summaries of toxic air contaminants (TACs) for industrial and non-industrial sources are provided in **Tables ES-1** and **ES-2**.

Health Risk Assessment Approach

Per Rule 1402, Ecoservices was required to prepare an Air Toxics Inventory Report (ATIR) and Health Risk Assessment (HRA) using facility emissions in 2017. The 2017 ATIR emissions are summarized in **Tables ES-1** and **ES-2**, which include industrial and non-industrial emissions of air toxics by source, along with estimates of maximum one hour and annual emissions in units of

lbs/hr and lbs/yr. More detailed information on ATIR emissions and modeling inputs can be accessed in **Appendix C**.

Table ES-3 lists the exposure pathway and target organ systems for the air toxics. Ecoservices submitted the ATIR on May 20, 2021, and provided an updated ATIR on August 23, 2021, in response to comments by the agency. The revised ATIR incorporated modified HCl emissions and natural gas combustion emissions from the acid plant, speciation of SVE pollutant emissions and added sulfur unloading emissions. This HRA incorporates all current emissions and assumptions provided in the ATIR. The HRA was conducted in four steps:

- The first step, called "hazard identification" was to identify the toxic air contaminants (TACs or air toxics) of concern, sources of those contaminants, and to estimate the emissions from each source.
- The second step, called "exposure assessment," was to quantify the amount of TACs that people are exposed to during a specific time-period, as well as the total number of people exposed. The United States Environmental Protection Agency's (U.S. EPA) American Meteorological Society/Environmental Protection Agency model, AERMOD (Version 21112), was used to perform the air dispersion modeling to estimate the ground level air concentrations of the air toxics.
- The third step is called "dose-response assessment." Dose is the amount of a chemical that enters the human body (or reaches a target organ); response is the resulting health effect from the level of the dose. The California Air Resources Board's (CARB) Hot Spots Analysis and Reporting Program (HARP2, Version 21081dated March 23, 2021) software was used to perform the calculations for this step as well as provide outputs for the last step as described below. Exposure pathways evaluated in the HRA include inhalation, dermal absorption, soil ingestion, homegrown produce, and mother's milk for the residential scenario and inhalation, dermal absorption, and soil ingestion for the worker scenario. Several pollutants with the potential to affect multi-pathways, including Polynuclear Aromatic Compounds (PAHs), arsenic, cadmium, hexavalent chromium, lead and nickel were evaluated for their cumulative potential to increase risk.
- The last step is called "risk characterization." Risk characterization ties together the above three steps to describe the type and magnitude of any increased health risks due to exposure to air toxic emissions from a facility.

Summary of Health Risk Results

To calculate population exposure and cancer burden, separate dispersion modeling runs are performed at receptors located at the centroid of census tracts whose centroid was located within the modeling domain. Although the HARP2 model contains the census tract centroid UTM coordinates and population values from the 2016 census; this data was not utilized for the assessment of population exposure and cancer burden because the cancer risk was not significant.

The HRA summary results are listed in **Table ES-4**. The estimated incremental cancer risk for the maximally exposed individual resident (MEIR) is 0.06 in a million, and for the maximally exposed individual worker (MEIW) is 0.03 in a million. **Figure ES-3** shows the locations of the MEIR, MEIW and PMI for cancer risk. Perchloroethylene emissions from the Soil Vapor

Extraction (SVE) system and polyaromatic hydrocarbons (PAHs) from the acid furnace are the primary contributors to cancer risk.

Figure ES-4 shows the locations of the MEIR, MEIW and the PMI for chronic hazard index (HI). The chronic hazard index is 0.15 at the both the PMI and MEIW and is 0.066 at the MEIR as listed in **Table ES-4**. None of the sensitive receptors are present in the zone of chronic HI impact so these receptors were not analyzed. Sulfuric acid from the acid furnace is the primary contributor to the chronic HI, accounting for approximately 94-95%, depending upon the receptor evaluated. The respiratory system is the primary target organ.

Figure ES-5 shows the locations of the PMI and MEIW for the 8-hour chronic hazard index. The maximum 8-hour chronic HI for both the PMI and MEIW is 0.000038 at the east property boundary of the facility. Benzene, from the SVE system, acid plant furnace and flare is the primary pollutant contributing to the 8-hour chronic HI. Blood is the target organ with the maximum 8-hour chronic HI.

Figure ES-6 shows the locations of the MEIR, MEIW, PMI and MEISR for acute hazard index. The maximum acute HI is 1.64 located at the west property boundary as listed in **Table ES-3**. The highest acute HI for residential receptors is 0.17, 290 meters northwest of the facility and for worker is 0.98 located 40 meters west of the facility. Hydrogen sulfide from the sulfur handling system is the primary contributor to acute HI and the central nervous system is the primary target organ.

Detailed discussions on the locations of the Maximum Impact (PMI), MEIR, MEIW, and maximally exposed individual sensitive receptor (MEISR) for cancer and non-cancer risks are included in Section 6. **Figures ES-3** to **ES-6** show the locations of these receptors. Note that the cancer risk and chronic hazard index are not indicated on the map for sensitive receptors since there is not a "zone of impact" for cancer risk above the threshold of 1 in a million or a chronic HI above 0.5. Additionally, because the cancer results at all receptors are less than significant, the excess cancer burden for the total population within the zone of impact is zero.

The SCAQMD's public notification thresholds are as follows:

- ≥ 10 in a million maximum individual (lifetime) cancer risk (MICR), or
- > 1.0 acute HI, or
- > 1.0 chronic HI

SCAQMD Rule 1402 action risk levels, which require a RRP are as follows:

- MICR: 25 in one million, or
- Cancer burden: 0.5, or
- Acute HI: 3.0, or
- Chronic HI: 3.0.

SCAQMD Rule 1402 also establishes significant risk levels as follows:

- MICR of 100 in one million (1.0×10^{-4}), or
- Acute HI or chronic HI of five (5.0) for any target organ system at any receptor location.

As shown in **Table ES-4**, the cancer risk, chronic and 8-hour HIs at all receptors are below the SCAQMD Rule 1402 action risk and significant risk levels. The acute HI at both the MEIR and MEIW are also below those thresholds; however, an acute HI of 1.64 was observed at a facility property boundary receptor. No residential, worker or sensitive receptor acute HI was found to be above the public notification thresholds.

2.0 Health Risk Assessment Report

This health risk assessment report guides the reader through the four steps of the health risk assessment process: a) hazard identification; b) exposure assessment; c) dose-response assessment and d) risk characterization. In the first step, hazard identification, facility industrial processes and supporting operations are evaluated to determine the type and quantities of potentially emitted substances capable of impacting worker and public health. The next step, exposure assessment, the potential pathways that potential pollutants could affect health risk are identified. The third step, dose-response assessment, simulates the concentrations of pollutants at specific locations to determine at what dosage various individuals (residential, sensitive receptors, workers) experience. The final step, risk characterization, uses all the data generated in the previous steps to predict the type and magnitude of health risks from pollutants from the facility on the surrounding community. Specific methodologies for each step in the health risk assessment process are described in the following subsections.

Hazard Identification

Facility Location and Description

Ecoservices (SCAQMD Facility ID No. 180908) is a manufacturer located at 20720 South Wilmington Avenue in the City of Carson. The land use in the immediate vicinity of the facility is primarily industrial or commercial urban area with the nearest residential neighborhood approximately 275 and 900 meters to the (southwest and southeast, respectively. The topography around the facility is generally flat. As recommended in the SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines1 and the SCAQMD Modeling Guidance for AERMOD3, the urban dispersion option was used with a population of 9,818,605, the population of Los Angeles County.

Ecoservices produces two main product lines in their Dominguez facility: sulfuric acid and aluminum sulfate. Sulfuric acid is the largest volume chemical manufactured in the United States and is used in many industries. The largest volume sulfuric acid customers for the Dominguez Plant are refineries who use sulfuric acid as a catalyst in their alkylation process. The aluminum sulfate solution is used primarily in the water treatment and paper manufacturing industries.

Potential onsite sources of emissions in the Dominguez Plant include the acid plant, acid plant furnace, startup heater and package boiler, non-refinery flare, sulfur unloading and Soil Vapor

Extraction (SVE) systems, and diesel air compressor, as well as a variety of space and comfort heaters. A site plot plan with sources and buildings is provided as **Figure 1** of this report.

Substances Emitted and Evaluated

The list of potentially emitted substances considered in preparation of the HRA is from Appendix A-I of the CARB Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program and the OEHHA Risk Assessment Guidelines2. The AB 2588 air toxics emitted from Ecoservices' industrial and non-industrial sources are shown in **Tables 1 and 2**, respectively. **Table 3** identifies the compounds evaluated for cancer risk, non-cancer chronic, or non-cancer acute impacts, as well as the compounds that have non-inhalation routes of exposure.

For carcinogens, cancer potency factors (CPF) were used for computing cancer risk. For non-cancer health effects, Reference Exposure Levels (RELs) were used. The non-carcinogenic hazard indices were computed for chronic, 8-hour chronic and acute exposures with their respective toxicological endpoints shown. For multi-pathway pollutants, oral doses, oral CPFs, and/or non-inhalation RELs were used as appropriate. All factors used were from the CARB/OEHHA consolidated table of values, incorporated into HARP2 and are summarized in **Table 4**.

Quantification of Emissions

The emission sources of air toxics at Ecoservices were identified and quantified using emissions from 2017. Detailed descriptions of how these emissions were calculated are shown in the ATIR, provided in Appendix C.

As described above, annual and maximum hourly emissions for TACs were reported from 15 source groups as shown in **Tables 1** and **Table 2**. Each source type is described below in terms of their types of TAC emissions and hours of operation.

Sulfuric Acid Plant (Permit ID# D1-D17 & C148), ATIR Source 1

Emissions of interest from the sulfuric acid process include sulfur dioxide, nitrogen oxides, and aerosol sulfuric acid mist. Information on each pollutant is discussed below.

Sulfur dioxide emissions are well controlled with the double absorption system and the tail gas caustic scrubber. Sulfur dioxide emissions are regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfur dioxide emissions are limited to 4 pounds of sulfur dioxide per ton of sulfuric acid produced. A more stringent limit is specified as a condition of a Consent Decree with the EPA that further limits sulfur dioxide emissions to 3.5 lbs. of sulfur dioxide per ton of sulfuric acid produced. Actual sulfur dioxide emissions are much lower than this limit. The caustic scrubber, installed to comply with reduced sulfur dioxide allowances under RECLAIM, has enabled the site to reach very low sulfur dioxide emissions.

Nitrogen oxide emissions from sulfuric acid plants are not regulated under any federal regulations. The site complies with RECLAIM allowances by using low NOx burners on the furnace and maintaining an adequate allocation.

Aerosol sulfuric acid mist emissions are considered particulates and regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfuric acid mist emissions are limited to 0.15 pounds of sulfuric acid mist per ton of sulfuric acid produced. Source test data for this source indicate that actual emissions are in the range of 0.018 lbs. of sulfuric acid mist/ton of acid produced. Aerosol sulfuric acid mist generated in the process is controlled by glass fiber demisters installed in the upper section of the strong acid absorption towers.

There are chloride contaminants in the spent sulfuric acid feedstock at the Dominguez plant. Although there is trial burn data showing a control efficiency of 99.91% for HCl, SCAQMD staff has requested that Ecoservices use a control efficiency of 99%.

Acid combustion in the furnace is assisted by two (2) 75 MMBtu/hour low NOx burners. The gas exhausting the combustion burners is treated by numerous exhaust gas processing devices (quench tower, gas cooling tower, gas drying tower) and multiple control devices including a dual stage electrostatic precipitator, acid absorption towers and a caustic wet scrubber before it is finally vented to the atmosphere (through the wet gas scrubber exhaust stack).

For completeness purposes, SCAQMD has requested inclusion of these auxiliary emissions in the ATIR and HRA. Since the combustion gas control efficiency of the pollution control devices on the furnace is difficult to quantify, Ecoservices has conservatively included these combustion pollutants as uncontrolled emissions in the health risk assessment. The gas burners are assumed to operate the same hours as the acid plant combustion or 24 hours per day, 7 days per week, 50 weeks per year, allowing for plant maintenance and down time. Combustion emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix A, **Table B-1**.

Package Boiler (Permit ID# D139), ATIR Source 2

Air toxics emissions from the boiler are the products of natural gas combustion. TACs emitted from this process include benzene, formaldehyde, PAHs, naphthalene, acetaldehyde, acrolein, ammonia, ethyl benzene, hexane, toluene and xylenes. The package boiler has a permitted capacity of 49 million BTUs per hour. This boiler generates high-pressure superheated steam. This boiler is operated only when the sulfuric acid process is down or in the start-up mode since the sulfuric acid process generates all necessary steam when operating. This boiler uses a low NOx burner to keep NOx emissions below the permit limit of 36.855 ppm. Emissions were calculated for this from emission factors in the AB 2588 Reporting Guidance, Appendix A, **Table B-1**.

Start-up Heater (Permit ID# D98), ATIR Source 3

As with the package boiler, the air toxics emission from the start-up heater are also products of natural gas combustion and the TACs emitted are those listed above. The start-up heater system has a rated capacity of 50 million BTUs per hour. The system consists of a preheat furnace and a preheat exchanger. The start-up heater system is used when the sulfuric acid process is in the startup mode when additional heating of the catalyst in the converter is needed. It operates intermittently and in 2017, operated 120 hours. The normal converter operating temperature is

800 ˚F and above. This equipment is used to start-up after turnarounds and after any shutdown when additional catalyst and converter heating is needed.

The combustion system for the furnace exhausts through the shell side of the preheat exchanger to the atmosphere. Process gas from the discharge of the main gas blower is directed through the tube side of the preheat exchanger and then into the converter. Once the catalyst/converter is adequately heated, the start-up heater system is shut down and bypassed. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix A, **Table B-1**.

Flare (Permit ID# C126), ATIR Source 4

The site has a flare with a pilot and gas assist with a rated capacity of 1.09 million BTUs per hour. The flare combusts exhaust from a caustic scrubber system treating vent gas, containing sulfur dioxide and potential VOCs, from truck and railcar unloading/loading facilities handling spent sulfuric acid. The caustic scrubber/flare system is also a backup vent system for spent sulfuric acid storage tanks that normally vent to the sulfuric acid plant regeneration furnace. The flare operates on a continuous basis. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix B, **Table B-1**.

Diesel Air Compressor (Permit ID# D100), ATIR Source 5

The diesel internal combustion engine drives a compressor utilized in the case of power outage to maintain safe pressure conditions in the acid plant. Normally, it is operated only for weekly testing; about 90 minutes per year. The use of this engine was terminated in 2017 but since it was tested that year, the testing emissions have been included in the ATIR. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix B, **Table B-2**.

Men's Changing Room Heaters (Exempt from Permit), ATIR Sources 6 and 7

The men's changing room has both a natural gas water heater and a comfort unit. The water heater has a rated heat input of 76,000 BTUs/hr. and the comfort heating system is rated at 90,000 BTU/hr. These heaters are used during the day shift November through April of each year. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix B, **Table B-1**.

Main Office Building Heaters (Exempt from Permit), ATIR Sources 8 through 12

The main office has 5 HVAC units fired by natural gas. Four of the units are rated at 100,000 BTU's/hr. and the other is rated at 90,000 BTUs/hr. These heaters are used during the day shift November through April of each year. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix B, **Table B-1**.

Maintenance Building Space Heaters (Exempt from Permit), ATIR Source 13

Ten natural gas-fired heaters are used in the maintenance building for workstation heating. The exhaust from these heaters is directed to a common location and discharged through a ridge vent that runs the length of the building along the roof centerline. One heater has a rated heat input of

30,000 BTUs/hr.; five are rated at 50,000 BTUs/hr. and four are rated at 100,000 BTUs/hr. These heaters are used during the day shift November through April of each year. Emissions were calculated for this source from emission factors in the AB 2588 Reporting Guidance, Appendix B, **Table B-1**.

SVE Removal System (DTSC Permit, ATIR Source 14

In the 1970's and 1980's, the facility transferred perchloroethylene (PCE) from railcars to storage tanks to trucks. A Soil Vapor Extraction (SVE) system was installed following closure of the storage tanks to remove PCE from the underlying soils. The system included an extraction well system, a blower, heat exchanger, water knock out tanks, and two carbon adsorption units arranged in series. The installation was conducted in accordance with an administrative agreement under the direction of the California Department of Toxic Substances Control (DTSC). The system became operational in the fourth quarter of 2016 and has continued to operate until recently. The facility is currently negotiating with DTSC to convert to a passive SVE system since the PCE removal rate have been asymptotic.

Since the system was in operation in 2017, emissions from the system are included in the ATIR. Monthly monitoring data, required as a condition under the SVE air permit, was used as the basis for the emissions estimate for this source. Acute emissions were based on the highest 2017 monthly monitoring results.

The 2017 ATIR contained emissions from perchloroethylene from a permitted soil vapor extraction system. The emissions included in the original ATIR (May 2021) were conservatively calculated for a single pollutant, perchloroethylene which is overwhelmingly the main contaminant of concern in terms of health risk. The perchloroethylene emissions were based on a mass balance based on the 2017 recorded VOC quantity captured by the dual carbon adsorption system. This approach assumed all VOC captured was perchloroethylene and control device utilized a lower-end control efficiency to conservatively estimate) air emissions. At SCAQMD's request, revised calculations now include emissions from other trace contaminants included in the sampling report data. Since this calculation method speciates the VOC emissions, annual emission estimates were calculated using the analytical monthly reporting results for individual chemicals.

Hourly emissions estimates were calculated using the same methodology as before, based on the maximum detected sampling data and the SVE process exhaust flow rate. Annual emissions are calculated from the average reported concentration of pollutant in the effluent of the adsorber from monthly grab sample analytical results and the SVE design gas flow rate (250 cfm or 15,000 cubic feet per hour). In cases where the pollutant was detected but concentrations were below the reporting limit, the pollutant concentration was conservatively assumed to be equal to the reporting value listed on the test result summary. This approach is overly conservative and overestimates impact of these trace pollutants; however, the reporting and detection limits of these trace compounds are quite low. Concentrations were tabulated from "Table 3 – Summary of SVE System Analytical Results" in the 4th Quarter SVE 2017 System report. The design exhaust flow rate is 250 acfm or 15,000 ft^3 per hour. The system operated January, February and August through December of 2017 for a total of 4704 hours.

Device 15, Process 1. Sulfur Handling/Unloading

The ATIR was also updated to include emissions of H2S that occur from the Sulfur Handling System. Emissions of H2S from the sulfur handling/unloading facility are minimal as the sulfur received and utilized at Ecoservice is degassed and has very low levels of H2S. Calculations for H2S emissions are based on degassing to a level of 10 ppmw, an upper bound in terms of concentration and a well-documented industry standard for degassing levels. H2S emissions from the sulfur unloading system were calculated assuming that emissions occur during the displacement of the H2S in the vapor space above the molten sulfur based on the vapor concentration in equilibrium with the sulfur at 300 degrees F. Derivation of the H2S emission factor based on equilibrium of H2S and displacement of vapor via sulfur handling are included in the ATIR. The vapor displacement volume is based on the density of molten sulfur and the maximum hourly and annual rates of sulfur handling/unloading at the facility. The maximum hourly sulfur unloading rate is based on two trucks per hour (24 LTN per truck) and 2017 annual sulfur deliveries of 49,885 LTN per year.

Exposure Assessment

Air Dispersion Modeling

U.S. EPA's AERMOD (version 21112) model was used to estimate ambient concentrations for Ecoservices. The air dispersion analysis was performed in accordance with OEHHA Risk Assessment Guidelines2, the SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines1, and SCAQMD's Modeling Guidance for AERMOD6. The results of the air dispersion analysis were used in conjunction with the chemical-specific emissions rates discussed above to estimate potential ambient air concentrations of each compound using Air Dispersion Modeling and Risk Tool (ADMRT) module in HARP2 (dated 21081) developed by CARB.

The air dispersion analysis requires the following: identification of source parameters and operating schedules, evaluation of building downwash effects, preparation of meteorological data, evaluation of potential terrain considerations, selection of appropriate dispersion coefficients based on land use, selection of receptor locations, and selection of appropriate averaging time periods. The following sections describe each of these steps.

Source Characterization

AERMOD requires source-specific parameters such as stack height, stack inside diameter, exit velocity, and stack gas temperature. **Table 5** presents the source parameters used in the AERMOD model for each modeled air toxic emission source. Three different representations of emission sources are used in the air dispersion model:

- Point sources;
- Area sources; and
- Volume sources.

Point sources are used to represent those emissions that have single identifiable points of release. A typical point source will have a stack with a defined location. Other sources, however, do not

have a single, discrete point of release. Sources that can be reasonably represented as emitting at a uniform rate over a two-dimensional surface are modeled as area sources. Sources that can be reasonably represented as emitting at a uniform rate from a three-dimensional space are modeled as volume sources.

The emission sources at Ecoservices were divided into three groups based on the source configuration (e.g., point, volume, or area source) used in the air dispersion model.

Most of the pollutants at the Ecoservices facility are emitted as point sources. The acid plant, package boiler, flare, and air compressor release pollutants vertically through uncapped stacks. The SVE emissions exhaust through a horizontally oriented stack. The preheater, water heater and comfort heaters (with the exception of the maintenance shop heater) also release pollutants via vertical stacks and those stacks are fitted with rain caps. The sulfur handling emissions are released as an area source since the system is configured in such a way that there is no central point of sulfur emissions. The maintenance shop is treated as a volume source since its emissions are released along with edge of the maintenance shop roof.

Source Parameters and Operating Schedules

The source parameters used as dispersion modeling inputs are summarized by source type in **Table 5**. **Table 6** summarizes assumptions for daily, weekly and yearly operation by source. The acid plant is in operation 24 hours per day, 7 days per week, except during yearly maintenance operations (about two weeks per year on average). The non-refinery flare associated with the produced and spent acid loading and unloading also runs continuously. Both the package boiler and start-up heaters provide supplemental heat to the acid plant when necessary. The package boiler operated 240 hours in 2017. In addition to supplemental heat, the start-up boiler is utilized to bring the acid plant up to full capacity after turnarounds. It operated 175 hours in 2017, typically at 50% of rated capacity.

The soil vapor extraction system operated 24 hours per day for 28 weeks during 2017. The former diesel air compressor, still in use in 2017, was operated 1.9 hours that year. Those hours were associated with emergency equipment testing. Given the Mediterranean climate in Los Angeles, the space heaters are typically used during the winter months, November through April. H2S emissions from the sulfur unloading system occur during sulfur handling and loading activities. The maximum hourly sulfur handling rate is based on two trucks per hour (24 LTN per truck) and 2017 annual sulfur deliveries of 49,885 LTN.

Building Downwash

All the point sources at the facility are located on or near the buildings. Consistent with SCAQMD Modeling Guidance for AERMOD3, the U.S. EPA-approved Building Profile Input Program PRIME (BPIPPRIME) was used to simulate the building downwash, which is the effect of nearby structures on the flow of the plumes from their respective emission sources.

Dispersion Parameters

Per the SCAQMD Modeling Guidance for AERMOD3, the urban dispersion option was used, with a population of 9,818,605 for Los Angeles County. AERMOD was run using the regulatory default option, using SCAQMD's Long Beach meteorological station as the most representative surface station for the facility based on the technical discussion with SCAQMD staff. As noted on the SCAQMD's website, Long Beach 2012-2016 station has five years of the processed meteorological data are available and approved for modeling. These five years of meteorological data with ADJ_U* option were used for the air dispersion modeling in the HRA.

Terrain

Terrain data were obtained from the United States Geological Survey (USGS), with 1/3 arcsecond (~10 meter) National Elevation Dataset (NED) data downloaded. Elevations and hill heights were calculated for all sources, buildings, and receptors, using AERMOD terrain preprocessor, AERMAP.

Receptor Locations

Health effect indices such as cancer risk, chronic HI, and acute HI were calculated for a variety of receptor locations. Receptors of primary interest are those at residential locations, at sensitive population locations, and at offsite worker locations. However, in order to get a more complete picture of the patterns of exposure, concentrations and risk are also calculated at regularly spaced grid points throughout the modeling domain.

Receptor networks were constructed for the dispersion analysis based on SCAQMD modeling guidance, including along the property boundary with a spacing of 20 meters, a fine grid containing receptors spaced 100 meters apart with 50-meter grids adjacent to the facility and in neighborhoods nearest to the site in all directions out to ensure that MEIR and MEIW locations were captured. Additionally, a medium coarse grid was created containing receptors spaced 200 meters apart out to a 2-km radius east to 710 and south to 405, west to Avalon and north to Victoria Street. **Figure 2** shows the entire receptor grid layout with land use overlay. The receptor grid spacing of 200, 100, 50 and 20 meters is illustrated in **Figures 3** to **5**. The grid receptor locations inside of the facility boundary are disregarded in the health risk analysis. All receptors were run with a height of 0.0 meters, so that ground-level concentrations are modeled. Sensitive receptor locations (schools, day care facilities, and hospitals) as included in **Table 7** were obtained via internet and Google Maps database searches and confirmed through windshield surveys. A total of 2160 property boundary and grid receptors were included in the analysis, plus an additional 14 sensitive receptors, for a total of 2174 receptors.

As cancer risks were determined to be insignificant, no additional modeling or calculations were required to evaluate population exposure and cancer burden.

Coordinate System

The Universal Transverse Mercator (UTM) system of coordinates and the World Geodetic System Datum 1984 (WGS 84) for identifying the UTM coordinates of the various modeling objects (sources, buildings, receptors etc.) was used.

Averaging Times

Calculation of chemical concentrations for use in exposure analysis requires the selection of appropriate concentration averaging times. Multiple dispersion averaging times are used in this analysis and discussed below. The AERMOD model input and output files used to estimate long- and short-term dispersion factors were provided electronically.

Long Term

Average concentrations over the five-year span of the Long Beach meteorological data were calculated for each compound for use in estimating potential residential cancer risks and chronic non-cancer health effects.

Short Term

Maximum short-term concentrations (one-hour averages) of the five-year period modeled were calculated using maximum hourly emission rates to estimate acute non-cancer health effects. One-hour maximum source-specific concentrations were summed regardless of time of occurrence (*i.e.*, hour of year), which can differ by source, thereby conservatively overestimating the true one-hour maximum at any one time.

8-Hour

The 8-hour chronic hazard index for the average daily worker was calculated using the annual concentration since the Ecoservices facility operates continuously. The worker is assumed to breathe the long-term annual average concentration during their work shift and no concentration adjustments are made when estimating 8-hour chronic health impacts.

Dispersion Factors

Point, volume and area source emissions were modeled using the X/Q ("chi over q") method, such that emission source groups are input to the model with unit average annual emission rates (*i.e.*, 1 gram per second [g/s]), and the model estimates 1-hour maximum or annual average dispersion factors (with units of [µg/m3]/[g/s]). To calculate annual average ambient air concentrations, the period average dispersion factors were multiplied by the annual emission rates. To calculate 1-hr maximum ambient air concentrations, the 1-hr maximum dispersion factors were multiplied by the maximum hourly emission rates.

Ground-Level Concentrations

Ground-level concentrations (GLCs) in the ambient air at each of the modeled Point of Maximum Impact (PMI), Maximally Exposed Individual Resident (MEIR) and the Maximally Exposed Individual Worker (MEIW) for the long-term, short-term and 8-hour risk scenarios are shown in **Tables 8 and 9**.

Exposure Assessment

Modeled health risks were estimated for Ecoservices based on methods and tools outlined in the OEHHA Risk Assessment Guidelines. Potential Ecoservices emissions and air dispersion results,

using the HARP2-ADMRT tool, were input into HARP2, the OEHHA-recommended program for completing an HRA.

Identification of Potentially Exposed Populations

The potentially exposed populations considered include current residents, off-site workers, and sensitive receptors located within the grid of receptors. Locations of each potentially exposed populations were identified based on review of aerial photographs using Google Earth and confirmed through a windshield survey. As described above, a list of modeled sensitive receptors within a one-mile radius of the facility is provided in **Table 7**. The nearest residential property identified is located at on E. Denwall Drive, approximately 275 meters northwest of Ecoservices. The nearest worker is located on Wilmington Avenue, directly west across Wilmington Avenue, approximately 40 meters away. The nearest sensitive receptor is located 275 meters northwest of the facility.

Health risks were estimated at the location of the MEIR and the location of the MEIW. The MEIR and MEIW are defined as the off-site receptor locations where individuals may reside or work, respectively, with the potential highest cancer risk, non-cancer acute HI, chronic HI and 8-hour HI. Note that the source of these risks may vary depending on whether the type of risk is cancer or non-cancer pollutant exposure. In addition, the point of maximum impact (PMI) was identified for acute non-cancer hazards.

Estimation of Exposure Point Concentrations

Exposure point concentrations are the concentrations of each chemical to which an individual may be exposed at a given receptor location. Chemical concentrations in air at each receptor location were estimated based on the air dispersion modeling described in Section 2.2. The exposure point concentrations used to estimate carcinogenic risks and chronic non-cancer HIs are based on the annual average concentrations of each chemical. The exposure point concentrations used to estimate acute non-cancer HIs are the one-hour maximum concentrations of each chemical. TAC concentrations representing 2017 operations used to estimate risk to the PMI, MEIR and MEIW are presented in **Tables 8** and **Table 9**.

Exposure Pathways

The exposure pathways evaluated in the HRA were selected in accordance with the SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines1. The inhalation pathway must be evaluated for all chemicals. In addition, SCAQMD also requires the evaluation of non-inhalation exposure pathways, referred to as a multi-pathway analysis, for specific chemicals.

Selection of the additional pathways for a multi-pathway analysis is specific to the chemical and land use in the area surrounding Ecoservices. As discussed previously, HARP2, which complements the OEHHA Risk Assessment Guidelines2 with respect to exposure pathway selection, was used in the HRA to estimate potential cancer risks and potential non-cancer hazards. The sections below discuss the exposure pathways considered for each potentially exposed population identified in the vicinity of Ecoservices.

Residents

It was assumed that residents may be exposed to Ecoservices emissions via inhalation, dermal absorption, incidental ingestion of soil, ingestion of homegrown produce, and mother's milk. A deposition rate of 0.02 meters per second (m/s) was used, per SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines.

Due to its location in an urbanized area with no drinking water reservoirs or agricultural areas (e.g., cattle grazing areas or dairy farms) within the zone of influence, the HRA does not include an evaluation of potential exposures via drinking water, ingestion of meat, dairy, or eggs.

Potential exposures to chemicals in homegrown produce were evaluated residents in the HRA because it is possible that residents in the area may have small vegetable gardens exclusively for personal use. The default home-grown produce parameters for urban settings were used in HARP2.

Off-Site Workers

Off-site workers are assumed to be potentially exposed to facility emissions via inhalation, dermal absorption, and incidental ingestion of soil. As assumed for residential exposure, a deposition rate of 0.02 meters per second (m/s) was used, per SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines.

Sensitive Receptors

The sensitive populations include schools, hospitals, nursing homes, and daycare centers as identified in **Table 7**. However, HARP2 does not include methods for evaluating these specific populations differently than residential populations. Thus, as a conservative screening approach, sensitive receptor locations were evaluated assuming the exposure pathways utilized for evaluating the residential population noted above.

Exposure Assumptions

For all pathways, default exposure assumptions built into HARP2 were used in the risk calculations. However, the specific exposure assumptions applied to calculate risks are dependent on the exposure analysis method selected to calculate risks.

HARP2 Exposure Analysis Methods

HARP2 allows a user to select from a series of exposure analysis methods. Each method in HARP2 utilizes exposure assumptions differently, depending on the requirements of a specific regulation (e.g., compliance with CARB's Air Toxics Hot Spots Program) or project need (e.g., provide point estimates for risk management decisions). That is, HARP2 will select the dominant pathway(s) and assign exposure assumptions depending on the exposure analysis method identified by the user. For the HRA, each exposure analysis method selected was based on the type of receptor as presented in **Table 10** and described below.

Resident

Potential cancer risks for residential populations were calculated based on RMP using the Derived (OEHHA) Method. This method applies conservative exposure assumptions to the two dominant exposure pathways for each chemical. The remaining pathways are evaluated using average exposure assumptions. If inhalation is one of the two dominant exposure pathways, then it is evaluated using the 80th percentile breathing rate.

It was assumed that a resident may be exposed to Ecoservices emissions for 30 years. Cancer risks estimated assuming a residential exposure duration of 30 years are used by state and local agencies for risk management and public notification purposes, even though it could be conservative and might not be representative of actual exposure scenarios.

As discussed previously, it was assumed that individuals residing in the vicinity of Ecoservices may ingest produce obtained from vegetable gardens grown at their homes. Ingestion of homegrown produce is estimated by applying a default parameter of 13.7 percent of produce ingested by individuals in an urban setting that is homegrown and is comprised of four categories including exposed, leafy, protected, and root vegetables. This estimate is the default setting in HARP2 and recommended in the SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines. The Derived (OEHHA) Analysis method was used to calculate chronic non-cancer HIs for the resident. This method utilizes high-end exposure assumptions to evaluate the two dominant pathways for each chemical. The remaining pathways are evaluated using average exposure assumptions.

Off-Site Workers

The Point Estimate Analysis method was used to calculate carcinogenic risks and chronic non-cancer HIs associated with off-site worker exposure to Ecoservices emissions. This method utilizes the standard exposure assumptions for worker populations.

Potential cancer risk sources are assumed to run continuously and no adjustment for off-site worker ground-level concentrations were used. This assumption is consistent with the OEHHA Risk Assessment Guidelines2 which recommends using the average concentration that the worker breathes over their workday, which, for continuous operation, is equivalent to the annual average air concentration calculated in AERMOD.

Sensitive Receptors

The RMP using the Derived Method described previously was used to calculate risks for the MEISR. Potential exposures of the MEISR were evaluated using a continuous 30-year exposure duration, consistent with the residential exposure duration.

Dose-Response Assessment

The dose-response assessment (also referred to as the toxicity assessment) examines the potential for a chemical to cause adverse health effects in exposed individuals (as modeled). Toxicity values that are used to estimate the likelihood of adverse effects occurring in humans are identified in this component of the risk assessment process. Toxicity factors in the latest HARP2

Health Database, integrated into the HARP2 program were used in the HRA. The HARP2 program contains the most up-to-date listing of available inhalation and oral CPFs, chronic inhalation and oral RELs, and acute RELs approved by California Environmental Protection Agency (Cal/EPA) for use in AB 2588 Air Toxics Hot Spots Program health risk assessments.

Risk Characterization Methodology

This section describes the methods used to estimate potential adverse effects associated with off-site exposures to chemicals emitted from the Ecoservices facility. HARP2 was used to estimate carcinogenic risks and non-cancer HIs associated with potential exposures to potential emissions from Ecoservices.

Carcinogenic Risks

Carcinogenic risks were estimated as the incremental probability that an individual will develop cancer over a 70-year lifetime as a direct result of exposure to carcinogens potentially present in facility emissions. The estimated risk is expressed as a unitless probability. For carcinogenic chemicals, both inhalation and non-inhalation pathways must be considered, using the CPFs in HARP2. Total risk is the sum of risks attributable to each chemical considered by each pathway. The equation used to calculate the potential excess cancer risk from inhalation for each carcinogenic chemical is:

$Risk_i$ = Inhalation Dose x Cancer Potency Factor

Where:

$Risk_i$ = Lifetime excess cancer risk from exposure to chemical i Inhalation

Dose = Inhalation dose of chemical i (mg/kg-day)

CPF_i = Inhalation CPF for chemical i (mg/kg-day)-1

A similar equation, using oral dose and the oral CPF, is used to calculate risks from oral exposure. In the HRA, oral cancer risks include dermal absorption, incidental ingestion of soil, ingestion of homegrown produce, and mother's milk. HARP2 default exposure parameters were used.

For worker cancer calculations, by default HARP2 assumes that emissions occur continuously, and the worker is exposed to the average concentration 40 hours per week.

Chronic Non-Cancer Hazards

When evaluating chronic non-cancer effects due to chemical exposures, a hazard quotient (HQ) is established for each constituent. The equation used to calculate an inhalation HQ is:

$$HQ_i = \frac{C_i}{REL_i}$$

Where:

HQ_i = Chronic hazard quotient for chemical i

C_i = Annual average air concentration of chemical i (µg/m3)

REL_i = Chronic REL for chemical i (µg/m3)

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Where:

HQ_i = Chronic hazard quotient for chemical i

C_i = Annual average air concentration of chemical i (µg/m3)

REL_i = Chronic REL for chemical i (µg/m3)

To evaluate the potential for adverse non-cancer health effects from simultaneous exposure to multiple chemicals, the HQs for all chemicals that affect the same target organ are summed yielding a HI. The HI is thus estimated as follows:

$$HQ_i = \frac{C_i}{REL_i} \qquad HI_{(eyes)} = \sum HQ_{substance\,1\,(eyes)} + HQ_{substance2\ \ (eyes)}$$

Estimation of non-inhalation chronic health effects uses a similar method, but the annual average air concentration is replaced by the dose calculated by HARP2 using the exposure parameters mentioned above, and the appropriate non-inhalation REL is used.

Estimation of an HI for each target organ (also referred to as a segregation of HI by target organ analysis) is recommended by OEHHA because the non-cancer effects of chemicals with different target organs are generally not additive. For the HRA, a segregation of hazard indices analysis was performed for the modeled PMI, MEIR and MEIW.

Acute Non-Cancer Hazards

The potential for acute effects was evaluated by comparing the one-hour maximum concentrations with the acute RELs within the HARP2 program. Acute HQs were estimated for those chemicals for which an REL was available. The equation used to calculate acute HQs is as follows:

$$HQ_i = \frac{C_i}{REL_i}$$

Where:

HQ_i = Acute hazard quotient for chemical i

C_i = One-hour maximum air concentration for chemical i (µg/m3)

REL_i = Acute non-cancer reference exposure level for chemical i (µg/m3)

The acute HQs for each chemical are summed to obtain a target organ-specific HI as follows:

$$HI_{(eyes)} = \sum HQ_{substance\,1\,(eyes)} + HQ_{substance2\ \ (eyes)}$$

AB 2588 Risk Characterization Results

Table 11 presents the results of the HRA at the modeled PMI, the modeled MEIR, and the modeled MEIW. No sensitive receptors with a cancer risk at or above 1 in one million were identified. The primary reason for this insignificant result is that no sensitive receptors are present within the zone of impact for either carcinogenic or non-carcinogenic risk. Non-cancer health hazard indices for all sensitive receptors are below 0.5. Since no significant cancer risk was identified, cancer burden results were not calculated (because they are zero). **Figures 7–9** show the locations of the PMI, MEIR and MEIW for chronic, 8-hour and acute hazard indices.

Acute HI contours at levels of 0.1, 0.5, 0.8 and 1.0 are shown in **Figure 9**. The results presented in the HRA are based on Ecoservices' 2017 emissions and modeled using the operating assumptions provided by Ecoservices.

Carcinogens

HARP2 calculates cancer risk based on annual average concentrations. Described below are the cancer risks estimated at the PMI, MEIR and MEIW.

Point of Maximum Impact (PMI)

The cancer risk at the point of maximum impact is 0.03 in a million, at the facility's east property boundary (receptor # 1958). Over 63% of the risk is due to perchloroethylene. Diesel exhaust particulate and carbon tetrachloride also contribute 11% and 7% of total risk, respectively. The SVE system is responsible for 82% of the risk. The remainder of the cancer risk is due primarily to emissions from the diesel compressor (12%) and the acid furnace (4%). Complete breakdowns of cancer risk by source at the PMI are provided in **Table 12**. Cancer risk at the PMI is broken down by substance and pathway in **Table 13**. **Figure 6** shows the location of the PMI for cancer risk.

Resident (MEIR)

The highest cancer risk at a residential receptor (# 622) is a cancer risk value of 0.06 in one million. The receptor is located about 325 meters northwest of Ecoservices. Most of the risk (62%) is due to PAH compounds. Other compounds contributing to residential risk are diesel (18%), perchloroethylene (10%) and benzene (4%). The sources contributing to the risk are the

acid furnace (54%), the diesel compressor (18%), the flare (14%) and the SVE system (13%). A complete breakdown of cancer risk by source at the MEIR is provided in **Table 10**. Cancer risk at the MEIR is broken down by substance and pathway in **Table 14**. **Figure 6** shows the location of the MEIR for cancer risk.

Off-Site Worker (MEIW)

The cancer risk for offsite worker exposure is 0.03 in a million, at the facility's east property boundary (receptor # 1958). Over 63% of the risk is due to perchloroethylene. Diesel exhaust particulate and carbon tetrachloride also contribute 11% and 7% of total risk, respectively. The SVE system is responsible for 82% of the risk. The remainder of the cancer risk is due primarily to emissions from the diesel compressor (12%) and the acid furnace (4%). Complete breakdowns of cancer risk by source are provided in **Table 12**. Cancer risk at the MEIW is broken down by substance and pathway in **Table 15**. **Figure 6** shows the location of the MEIW for cancer risk.

Maximally Exposed Individual Sensitive Receptor (MEISR)

The highest calculated cancer risk at a sensitive receptor was not evaluated since there are no sensitive receptors in the carcinogenic risk impact zone. The risk at all sensitive receptors is lower than the MEIR.

Population Exposure & Cancer Burden

Although SCAQMD AB 2588 protocols dictate that potential population exposure be analyzed and potential cancer burden calculated within the modeled zone of impact, this analysis was not conducted as the cancer risk results were below the 1-in-a-million significance threshold (and the corresponding cancer burden for risks above this threshold is zero).

Non-Carcinogens

The non-cancer health impacts are characterized through a HI. When more than one chemical is considered, it is assumed that their effects are additive provided the associated chemicals are expected to have an adverse impact on the same target organ system (respiratory system, liver, etc.). Thus, chemical-specific hazard indices are summed to arrive at a hazard index for each target organ. For any organ system, a total hazard index exceeding 1.0 indicates a potential health effect. Although the assumption of additivity of exposure to multiple chemicals ignores possible antagonistic or synergistic interactions, this approach has been accepted by regulatory agencies as generally conservative.

Chronic HI

The chronic HI calculations are based on annual average concentrations. The chronic HI at the PMI is 0.15, at receptor # 509 located in the tank farm north of property boundary. The primary chemical contributing to the chronic HI is sulfuric acid (93.6%). Hydrogen sulfide contributed 5.8% and hydrochloric acid contributed 0.7% of the risk. The associated target organ is the respiratory system. Over 94% of the chronic risk is a result of emissions from the acid furnace with the sulfur handling system contributing 6%. The maximum chronic risk at a worker receptor is identical to the PMI as it occurs at the same receptor location.

The maximum chronic risk at a residential receptor (MEIR) is a chronic HI of 0.07, at receptor # 622 located about 325 meters northwest of Ecoservices. The primary chemical contributing to the chronic HI is sulfuric acid (94%), with hydrogen sulfide and hydrochloric acid contributing 5% and 1%, respectively. The associated target organ is the respiratory system. Approximately 95% of the chronic risk is a result of emissions from the acid furnace with the sulfur handling system contributing 5%.

The maximum chronic risk at a sensitive receptor was not calculated because no sensitive receptors are located within the zone of impact for chronic HI. The chronic risk at all sensitive receptors is lower than the risk at the chronic MEIR.

Complete breakdowns of chronic risk by source at each of the maximum chronic HI receptors are provided in **Table 16**. Chronic HI is broken down by substance in **Tables 17–19**. **Figure 7** shows the location of these receptors.

8-Hour Chronic HI

The 8-hr chronic HI at the PMI/MEIW is 0.0000377, at a property boundary receptor (# 1959) on the eastern boundary of the facility. The primary chemical contributing to the 8-hr chronic HI is benzene (100%). The associated target organ is blood. The sources responsible for over 60% of the 8-hr chronic risk is the SVE system. The acid plant furnace and flare contribute 28% and 10%, respectively of the remaining risk. Complete breakdowns of chronic risk by source at each of the PMI/MEIW are provided in **Table 20**. Chronic HI is broken down by substance in **Tables 21 and 22**. The eye is the primary target organ for the maximum 8-hour chronic HI, **Figure 8** shows the location of these receptors.

Acute HI

The acute HI at the point of maximum impact PMI) is 1.64, at receptor # 1999 located at the west property boundary of the facility. The primary chemical contributing to the acute HI is hydrogen sulfide (100%). The associated target organ is the respiratory system. The sulfur handling system is the main source of the hydrogen sulfide. The maximum impact occurs during the unloading of liquid sulfur.

The maximum acute risk at a residential receptor is an acute HI of 0.17, at receptor # 597 located about 175 meters northwest of Ecoservices. The primary chemical contributing to the acute HI is hydrogen sulfide (100%). The associated target organ is the central nervous system (CNS). All (100%) of the acute risk is a result of emissions from the sulfur handling system.

The maximum acute risk at a sensitive receptor (MEISR) was not calculated since no sensitive receptors were located in an acute HI impact zone. The acute risk all sensitive receptors is lower than the acute risk at the MEIR.

The acute HI at the MEIW of 0.97 at receptor # 438 located directly east and across Wilmington Avenue from the facility. The primary chemical contributing to the acute HI is hydrogen sulfide (100%). The associated target organ is the central nervous system. All (100%) of the acute risk at the MEIW is a result of emissions from the sulfur handling system.

Complete breakdowns of acute risk by source at each of the maximum acute HI receptors are provided in **Table 23**. Acute HI is broken down by substance in **Tables 24–26**. **Figure 9** shows the location of these receptors. A map showing the acute HI contours is included as **Figure 10**.

3.0 Conclusions

The HRA results are summarized in **Table ES-4**. As shown in this table the cancer risk is 0.03 in one million at the PMI/MEIW and 0.06 in one million at the MEIR. The table also shows a chronic HI of 0.15 at the PMI/MEIW and 0.066 at the MEIR.

Public Notification

If results of this HRA indicate that cancer risk, chronic HI, and acute HI are greater than or equal to the Notification Risk Level, Ecoservices would be required to provide public notice, in accordance with the procedures in the most current version of "SCAQMD Public Notification Procedures for Facilities Under the Air Toxics 'Hot Spots' Information and Assessment Act (AB 2588) and Rule 1402.1"

The SCAQMD's public notification thresholds are as follows:

- ≥ 10 in a million maximum individual (lifetime) cancer risk (MICR), or
- > 1.0 acute HI, or
- > 1.0 chronic HI

SCAQMD Rule 1402 action risk levels, which require a RRP are as follows:

- MICR: 25 in one million, or
- Cancer burden: 0.5, or
- Acute HI: 3.0, or
- Chronic HI: 3.0.

SCAQMD Rule 1402 also establishes significant risk levels as follows:

- MICR of 100 in one million (1.0 x 10-4), or
- Acute HI or chronic HI of five (5.0) for any target organ system at any receptor location.

As shown in **Table ES-4**, the cancer and non-cancer (acute, chronic) risks at the PMI, MEIR, MEIW and MEISR are below the SCAQMD Rule 1402 action risk and significant risk levels. However, an acute HI of 1.64 at a property boundary receptor adjacent to a roadway and sidewalk was predicted where there is public access. No residential, worker or sensitive receptor acute HI was found to be above the public notification thresholds.

Appendix A
Tables

Table ES-1: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hourly lbs/hr	Annual Average lbs/yr
1	D1-D17/C148	Acid Plant Furnace	HCl	0.083333	560.10
			Sulfuric Acid	1.087500	8,647.56
1	D1-D17/C148	Acid Plant Furnace	Benzene	0.000829	3.69
		(Natural Gas Combustion)	Formaldehyde	0.001757	7.83
			PAH, total, w/o individual components	0.000014	0.06
			Napthalene	0.000043	0.19
			Acetaldehyde	0.000443	1.97
			Ethyl Benzene	0.000986	4.39
			Hexane	0.000657	2.93
			Toluene	0.003786	16.88
			Xylenes	0.002814	12.55
2	D139	Package Boiler	Benzene	0.000273	0.0237
			Formaldehyde	0.000578	0.0503
			PAH, total, w/o individual components	0.000005	0.0004
			Naphthalene	0.000014	0.0012
			Acetaldehyde	0.000146	0.0127
			Ammonia	0.150400	13.0752
			Ethyl Benzene	0.000324	0.0282
			Hexane	0.000216	0.0188
			Toluene	0.001246	0.1083
			Xylenes	0.000926	0.0805
3	D98	Startup Heater	Benzene	0.000200	0.0214
			Formaldehyde	0.000500	0.0453
			PAH, total, w/o individual components	0.000004	0.0004
			Naphthalene	0.000013	0.0011
			Acetaldehyde	0.000130	0.0114
			Ammonia	0.134400	11.7952
			Ethyl Benzene	0.000290	0.0254
			Hexane	0.000193	0.0170
			Toluene	0.001113	0.0977
			Xylenes	0.000827	0.0726
4	C126	Non-Refinery Flare	Benzene	0.014390	0.4122
			Formaldehyde	0.105795	3.0308
			PAH, total, w/o individual components	0.000272	0.0078
			Naphthalene	0.000996	0.0285
			Acetaldehyde	0.003892	0.1115
			Ethyl Benzene	0.130682	3.7438
			Hexane	0.002625	0.0752
			Toluene	0.005249	0.1504
			Xylenes	0.002625	0.0752
5	D100	Diesel Air Compressor	Benzene	0.001043	0.00198
			1,3-Butadiene	0.001217	0.00231
			Cadmium	0.000008	0.00002
			Formaldehyde	0.009666	0.01837
			Hexavalent Chromium	0.000001	0.00000
			Arsenic	0.000009	0.00002
			Lead	0.000046	0.00009
			Nickel	0.000022	0.00004
			PAH, total, w/o individual components	0.000203	0.00039
			Naphthalene	0.000110	0.00021
			Acetaldehyde	0.004386	0.00833
			Ammonia	0.004500	0.00850
			Copper	0.000023	0.00004
			Ethyl Benzene	0.000061	0.00012
			Hexane	0.000151	0.00029
			HCl	0.001043	0.00198
			Manganese	0.000017	0.00003
			Mercury	0.000011	0.00002
			Selenium	0.000012	0.00002
			Toluene	0.000590	0.00112
			Xylenes	0.000237	0.00045
			Diesel Exhaust Particulates	0.187600	0.35640

Table ES-1: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hourly lbs/hr	Annual Average lbs/yr
14	DTSC Permit	SVE Extaction System	Perchloroethylene	0.013110	7.1124
			Trichloroethylene	0.001690	0.9991
			Carbon Tetrachloride	0.000042	0.1152
			Chloroform	0.000684	0.1241
			Vinyl Chloride	0.000017	0.0428
			1,1-dichloroethane	0.000026	0.0725
			Toluene	0.000025	0.0648
			Benzene	0.000015	0.0360
			Isopropyl Alcohol	0.000169	0.4640
			Methylene Chloride	0.000027	0.0847
			Xylenes (p/m/o)	0.000029	0.0930
			Ethyl Benzene	0.000029	0.1013
			1,1,1-trichloroethane	0.000037	0.1248
			Styrene	0.000029	0.0899
15	D130	Sulfur Unloading	Hydrogen Sulfide	0.445440	462.93

Table ES-2: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Annual Average lbs/yr
6	1	Exempt	Comfort Heater Men's Changing Room	90K BTU/hr	Benzene	0.00000069	0.000343
					Formaldehyde	0.00000146	0.000729
					PAH, total, w/o individ. components	0.00000001	0.000004
					Naphthalene	0.00000003	0.000013
					Acetaldehyde	0.00000037	0.000184
					Ammonia	0.00027427	0.137280
					Ethyl Benzene	0.00000081	0.000408
					Hexane	0.00000054	0.000270
					Toluene	0.00000314	0.001570
					Xylenes	0.00000233	0.001167
7	1	Exempt	Water Heater Men's Changing Room	76K BTU/hr	Benzene	0.00000058	0.000309
					Formaldehyde	0.00000123	0.000656
					PAH, total, w/o individ. components	0.00000001	0.000004
					Naphthalene	0.00000002	0.000012
					Acetaldehyde	0.00000031	0.000166
					Ammonia	0.00023162	0.123520
					Ethyl Benzene	0.00000069	0.000367
					Hexane	0.00000046	0.000243
					Toluene	0.00000265	0.001413
					Xylenes	0.00000197	0.001050
8	5	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.000200
					Formaldehyde	0.00000162	0.000424
					PAH, total, w/o individ. components	0.00000001	0.000002
					Naphthalene	0.00000003	0.000007
					Acetaldehyde	0.00000041	0.000107
					Ammonia	0.00030477	0.079872
					Ethyl Benzene	0.00000090	0.000237
					Hexane	0.00000060	0.000157
					Toluene	0.00000349	0.000914
					Xylenes	0.00000259	0.000679
9	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.000200
					Formaldehyde	0.00000162	0.000424
					PAH, total, w/o individ. components	0.00000001	0.000002
					Naphthalene	0.00000003	0.000007
					Acetaldehyde	0.00000041	0.000107
					Ammonia	0.00030477	0.079872
					Ethyl Benzene	0.00000090	0.000237
					Hexane	0.00000060	0.000157
					Toluene	0.00000349	0.000914
					Xylenes	0.00000259	0.000679
10	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.000200
					Formaldehyde	0.00000162	0.000424
					PAH, total, w/o individ. components	0.00000001	0.000002
					Naphthalene	0.00000003	0.000007
					Acetaldehyde	0.00000041	0.000107
					Ammonia	0.00030477	0.079872
					Ethyl Benzene	0.00000090	0.000237
					Hexane	0.00000060	0.000157
					Toluene	0.00000349	0.000914
					Xylenes	0.00000259	0.000679

Table ES-2: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Annual Average lbs/yr
11	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.000200
					Formaldehyde	0.00000162	0.000424
					PAH, total, w/o individ. components	0.00000001	0.000002
					Naphthalene	0.00000003	0.000007
					Acetaldehyde	0.00000041	0.000107
					Ammonia	0.00030477	0.079872
					Ethyl Benzene	0.00000090	0.000237
					Hexane	0.00000060	0.000157
					Toluene	0.00000349	0.000914
					Xylenes	0.00000259	0.000679
12	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000069	0.000180
					Formaldehyde	0.00000146	0.000382
					PAH, total, w/o individ. components	0.00000001	0.000002
					Naphthalene	0.00000003	0.000007
					Acetaldehyde	0.00000037	0.000097
					Ammonia	0.00027427	0.071872
					Ethyl Benzene	0.00000081	0.000213
					Hexane	0.00000054	0.000142
					Toluene	0.00000314	0.000822
					Xylenes	0.00000233	0.000611
13	1	Exempt	Space Heater Maintenance Shop	30K BTU/hr (1) 50 KBTU/hr (5) 100 KBTU/hr (4) (680 KBTU/hr combined) (Exhaust out out of bldg ridge vent)	Benzene	0.00000518	0.000938
					Formaldehyde	0.00001101	0.001994
					PAH, total, w/o individ. components	0.00000006	0.000012
					Naphthalene	0.00000019	0.000035
					Acetaldehyde	0.00000012	0.000504
					Ammonia	0.00207238	0.375360
					Ethyl Benzene	0.00000615	0.001114
					Hexane	0.00000408	0.000739
					Toluene	0.00002370	0.004293

Table ES-3: Exposure Pathways and Target Organs by TAC

Chemical Name	CAS Number	Multi-Pathway	Inhalation	Soil Injestion	Dermal	Home-Grown Produce	Mother's Milk	Acute Target Organs									Chronic Target Organs											8-Hour Chronic Target Organs								
								CV	CNS	IMMUN	GILV	REPRO-DEVEL	RESP	SKIN	EYE	BLOOD	CV	CNS	IMMUN	KIDNEY	GILV	REPRO-DEVEL	RESP	SKIN	EYE	BONE-TEETH	ENDO	BLOOD	CV	CNS	IMMUN	KIDNEY	REPRO	RESP	SKIN	EYE	BLOOD
Acetaldehyde	75070		X										X		X								X										X			
Benzene	71432		X							X		X				X												X								X
Ethyl Benzene	100414		X																	X	X	X					X									
Formaldehyde	50000		X												X								X										X			
HCl	7647010		X										X		X								X													
Hexane	110543		X															X																		
Napthalene	91203		X																				X													
PAHs-w/o	1151	X	X	X	X	X	X																													
Sulfuric Acid	7664939		X										X										X													
Toluene	108883		X						X				X		X										X										X	
Xylenes	1330207		X						X				X		X			X					X		X											
NH3	7664417		X										X		X								X													
1,3-Butadiene	106990		X									X										X										X				
Arsenic	7440382	X	X	X	X	X		X	X			X					X	X				X	X	X					X	X			X	X	X	
Cadmium	7440439	X	X	X	X															X			X													
Copper	7440508		X										X																							
Cr(VI)	18540299	X	X	X	X	X																	X					X								
DieselExhPM	9901		X																				X													
Lead	7439921	X	X	X	X	X	X																													
Manganese	7439965		X															X												X						
Mercury	7439976	X	X	X	X	X			X			X						X		X		X								X		X	X			
Nickel	7440020	X	X	X	X					X												X	X					X			X			X		
Selenium	7782492		X	X	X												X	X			X															
1,1,1-TCA	71556		X						X									X																		
1,1-DiChloroEthane	75343		X																																	
CC14	56235		X						X		X	X						X			X	X														
Chloroform	67663		X						X			X	X							X	X	X														
Isopropyl Alcohol	67630		X										X		X					X		X														
Methylene Chloride	75092		X					X	X								X	X																		
Perchloroethylene	127184		X						X				X		X					X	X															
Styrene	100425		X									X	X		X			X																		
TCE	79016		X															X							X											
Vinyl Chloride	75014		X						X				X		X																					
H2S	7783064		X						X													X														

Table ES-4: Summary of Health Risks

Cancer Risk (per million exposed)	
Point of Maximum Impact (PMI)	0.03
Maximally Exposed Individual Resident (MEIR)	0.06
Maximally Exposed Individual Worker (MEIW)	0.03
Chronic Hazard Index	
Maximally Exposed Individual Resident (MEIR)	0.07
Maximally Exposed Individual Worker (MEIW)	0.15
8-Hour Chronic Hazard Index	
Point of Maximum Impact (PMI)	0.000038
Acute Hazard Index	
Point of Maximum Impact (PMI)	1.64

Table 1: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hourly lbs/hr	Annual Average lbs/yr
1	D1-D17/C148	Acid Plant Furnace	HCl	0.0833	560.104
			Sulfuric Acid	1.0875	8,647.560
1	D1-D17/C148	Acid Plant Furnace (Natural Gas Combustion)	Benzene	0.000829	3.694020
			Formaldehyde	0.001757	7.833870
			PAH, total, w/o individual components	0.000014	0.063690
			Naphthalene	0.000043	0.191070
			Acetaldehyde	0.000443	1.974390
			Ethyl Benzene	0.000986	4.394610
			Hexane	0.000657	2.929740
			Toluene	0.003786	16.877900
			Xylenes	0.002814	12.546900
2	D139	Package Boiler	Benzene	0.000273	0.023699
			Formaldehyde	0.000578	0.050258
			PAH, total, w/o individual components	0.000005	0.000409
			Naphthalene	0.000014	0.001226
			Acetaldehyde	0.000146	0.012667
			Ammonia	0.150400	13.075200
			Ethyl Benzene	0.000324	0.028193
			Hexane	0.000216	0.018796
			Toluene	0.001246	0.108279
			Xylenes	0.000926	0.080494
3	D98	Startup Heater	Benzene	0.000244	0.021379
			Formaldehyde	0.000517	0.045338
			PAH, total, w/o individual components	0.000004	0.000369
			Naphthalene	0.000013	0.001106
			Acetaldehyde	0.000130	0.011427
			Ammonia	0.134400	11.795200
			Ethyl Benzene	0.000290	0.025433
			Hexane	0.000193	0.016956
			Toluene	0.001113	0.097679
			Xylenes	0.000827	0.072614
4	C126	Non-Refinery Flare	Benzene	0.014390	0.412228
			Formaldehyde	0.105795	3.030786
			PAH, total, w/o individual components	0.000272	0.007778
			Naphthalene	0.000996	0.028519
			Acetaldehyde	0.003892	0.111483
			Ethyl Benzene	0.130682	3.743759
			Hexane	0.002625	0.075186
			Toluene	0.005249	0.150373
			Xylenes	0.002625	0.075186
5	D100	Diesel Air Compressor	Benzene	0.001043	0.001982
			1,3-Butadiene	0.001217	0.002313
			Cadmium	0.000008	0.000016
			Formaldehyde	0.009666	0.018366
			Hexavalent Chromium	0.000001	0.000001
			Arsenic	0.000009	0.000017
			Lead	0.000046	0.000088
			Nickel	0.000022	0.000041
			PAH, total, w/o individual components	0.000203	0.000385
			Naphthalene	0.000110	0.000210
			Acetaldehyde	0.004386	0.008334
			Ammonia	0.004480	0.008512
			Copper	0.000023	0.000044
			Ethyl Benzene	0.000061	0.000116
			Hexane	0.000151	0.000286
			HCl	0.001043	0.001982
			Manganese	0.000017	0.000033
			Mercury	0.000011	0.000021
			Selenium	0.000012	0.000023
			Toluene	0.000590	0.001121
			Xylenes	0.000237	0.000451
			Diesel Exhaust Particulates	0.187600	0.356440

Table 1: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hourly lbs/hr	Annual Average lbs/yr
14	DTSC Permit	SVE Extaction System	Perchloroethylene	0.013110	7.112448
			Trichloroethylene	0.001690	0.999130
			Carbon Tetrachloride	0.000042	0.115225
			Chloroform	0.000684	0.124115
			Vinyl Chloride	0.000017	0.042809
			1,1-dichloroethane	0.000026	0.072536
			Toluene	0.000025	0.064774
			Benzene	0.000015	0.036021
			Isopropyl Alcohol	0.000169	0.464003
			Methylene Chloride	0.000027	0.084672
			Xylenes (p/m/o)	0.000029	0.092998
			Ethyl Benzene	0.000029	0.101324
			1,1,1-trichloroethane	0.000037	0.124821
			Styrene	0.000029	0.089893
15	D130	Sulfur Unloading	Hydrogen Sulfide	0.4454	462.933

Table 2: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Annual Average lbs/yr
6	1	Exempt	Comfort Heater Men's Changing Room	90K BTU/hr	Benzene	0.00000069	0.00034
					Formaldehyde	0.00000146	0.00073
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000037	0.00018
					Ammonia	0.00027427	0.13728
					Ethyl Benzene	0.00000081	0.00041
					Hexane	0.00000054	0.00027
					Toluene	0.00000314	0.00157
					Xylenes	0.00000233	0.00117
7	1	Exempt	Water Heater Men's Changing Room	76K BTU/hr	Benzene	0.00000058	0.00031
					Formaldehyde	0.00000123	0.00066
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000002	0.00001
					Acetaldehyde	0.00000031	0.00017
					Ammonia	0.00023162	0.12352
					Ethyl Benzene	0.00000069	0.00037
					Hexane	0.00000046	0.00024
					Toluene	0.00000265	0.00141
					Xylenes	0.00000197	0.00105
8	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.00020
					Formaldehyde	0.00000162	0.00042
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000041	0.00011
					Ammonia	0.00030477	0.07987
					Ethyl Benzene	0.00000090	0.00024
					Hexane	0.00000060	0.00016
					Toluene	0.00000349	0.00091
					Xylenes	0.00000259	0.00068
9	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.00020
					Formaldehyde	0.00000162	0.00042
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000041	0.00011
					Ammonia	0.00030477	0.07987
					Ethyl Benzene	0.00000090	0.00024
					Hexane	0.00000060	0.00016
					Toluene	0.00000349	0.00091
					Xylenes	0.00000259	0.00068
10	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.00020
					Formaldehyde	0.00000162	0.00042
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000041	0.00011
					Ammonia	0.00030477	0.07987
					Ethyl Benzene	0.00000090	0.00024
					Hexane	0.00000060	0.00016
					Toluene	0.00000349	0.00091
					Xylenes	0.00000259	0.00068

Table 2: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Annual Average lbs/yr
11	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000076	0.00020
					Formaldehyde	0.00000162	0.00042
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000041	0.00011
					Ammonia	0.00030477	0.07987
					Ethyl Benzene	0.00000090	0.00024
					Hexane	0.00000060	0.00016
					Toluene	0.00000349	0.00091
					Xylenes	0.00000259	0.00068
12	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	0.00000069	0.00018
					Formaldehyde	0.00000146	0.00038
					PAH, total, w/o individual components	0.00000001	0.00000
					Naphthalene	0.00000003	0.00001
					Acetaldehyde	0.00000037	0.00010
					Ammonia	0.00027427	0.07187
					Ethyl Benzene	0.00000081	0.00021
					Hexane	0.00000054	0.00014
					Toluene	0.00000314	0.00082
					Xylenes	0.00000233	0.00061
13	1	Exempt	Space Heater Maintenance Shop	30K BTU/hr (1) 50 KBTU/hr (5) 100 KBTU/hr (4) (680 KBTU/hr Combined) (Exhaust out of bldg ridge vent)	Benzene	0.00000518	0.00094
					Formaldehyde	0.00001101	0.00199
					PAH, total, w/o individual components	0.00000006	0.00001
					Naphthalene	0.00000019	0.00004
					Acetaldehyde	0.00000012	0.00050
					Ammonia	0.00207238	0.37536
					Ethyl Benzene	0.00000615	0.00111
					Hexane	0.00000408	0.00074
					Toluene	0.00002370	0.00429
					Xylenes	0.00001762	0.00319

Table 3: Exposure Pathway and Target Organ by TAC

Chemical Name	CAS Number	Multi-Pathway	Inhalation	Soil Injestion	Dermal	Home-Grown Produce	Mother's Milk	Acute Target Organs									Chronic Target Organs											8-Hour Chronic Target Organs								
								CV	CNS	IMMUN	GILV	REPRO-DEVEL	RESP	SKIN	EYE	BLOOD	CV	CNS	IMMUN	KIDNEY	GILV	REPRO-DEVEL	RESP	SKIN	EYE	BONE-TEETH	ENDO	BLOOD	CV	CNS	IMMUN	KIDNEY	REPRO	RESP	SKIN	EYE	BLOOD
Acetaldehyde	75070		X										X		X								X										X			
Benzene	71432		X							X		X				X											X									X
Ethyl Benzene	100414		X																	X	X	X					X									
Formaldehyde	50000		X												X								X										X			
HCl	7647010		X										X		X								X													
Hexane	110543		X															X																		
Napthalene	91203		X																				X													
PAHs-w/o	1151	X	X	X	X	X	X																													
Sulfuric Acid	7664939		X										X										X													
Toluene	108883		X						X				X		X										X										X	
Xylenes	1330207		X						X				X		X			X					X		X											
NH3	7664417		X										X		X								X													
1,3-Butadiene	106990		X									X										X											X			
Arsenic	7440382	X	X	X	X	X		X	X			X					X	X				X	X	X					X	X			X	X	X	
Cadmium	7440439	X	X	X	X	X														X			X													
Copper	7440508		X										X																							
Cr(VI)	18540299	X	X	X	X	X																	X													
DieselExhPM	9901		X																				X													
Lead	7439921	X	X	X	X	X	X																													
Manganese	7439965		X															X												X						
Mercury	7439976	X	X	X	X	X			X			X						X		X		X								X		X	X			
Nickel	7440020	X	X	X	X	X				X													X					X			X			X			
Selenium	7782492		X														X	X			X															
1,1,1-TCA	71556		X						X									X																		
1,1-DiChloroEthane	75343		X																																	
CC14	56235		X						X		X	X						X			X	X														
Chloroform	67663		X						X			X	X							X	X	X														
Isopropyl Alcohol	67630		X										X		X					X		X														
Methylene Chloride	75092		X					X	X								X	X																		
Perchloroethylene	127184		X						X				X		X					X	X															
Styrene	100425		X									X	X		X			X																		
TCE	79016		X															X							X											
Vinyl Chloride	75014		X						X				X		X																					
H2S	7783064		X						X														X													

Table 4: Risk Assessment Health Values

Chemical Name	CAS Number	Inhalation Unit Risk Factor	Inhalation Cancer Slope Factor	Oral Cancer Slope Factor	Acute REL	8-Hour Chronic Inhalation REL	Inhalation Chronic REL	Oral Chronic
		$(\mu g/m^3)^{-1}$	$(mg/kg\text{-}d)^{-1}$	$(mg/kg\text{-}d)^{-1}$	$(\mu g/m^3)$	$(\mu g/m^3)$	$(\mu g/m^3)$	(mg/kg-d)
Acetaldehyde	75070	2.70E-06	0.01		470	300	140	
Benzene	71432	2.90E-05	0.1		27	3	3	
Ethyl Benzene	100414	2.50E-06	0.0087				2000	
Formaldehyde	50000	6.00E-06	0.021		55	9	9	
HCl	7647010				2100		9	
Hexane	110543						7000	
Napthalene	91203	3.40E-05	0.12				9	
PAHs-w/o	1151	0.0011	3.9	12				
Sulfuric Acid	7664939				120		1	
Toluene	108883				5000	830	420	
Xylenes	1330207				22000		700	
NH3	7664417				3200		200	
1,3-Butadiene	106990	0.00017	0.6		660	9	2	
Arsenic	7440382	0.0033	12	1.5	0.2	0.015	0.015	3.50E-06
Cadmium	7440439	0.0042	15				0.02	0.0005
Copper	7440508				100			
Cr(VI)	18540299	0.15	510	0.5			0.2	2.00E-02
DieselExhPM	9901	0.0003	1.1				5	
Lead	7439921	1.20E-05	0.042	0.0085				
Manganese	7439965					0.17	0.09	
Mercury	7439976				0.6	0.06	0.03	0.00016
Nickel	7440020	0.00026	0.91		0.2	0.06	0.014	1.10E-02
Selenium	7782492						20	5.00E-03
1,1,1-TCA	71556				68000		1000	
1,1-DiChloroEthane	75343	1.60E-06	0.0057					
CC14	56235	4.20E-05	0.15		1900		40	
Chloroform	67663	5.30E-06	0.019		150		300	
Isopropyl Alcohol	67630				3200		7000	
Methylene Chloride	75092	1.00E-06	0.0035		14000		400	
Perchloroethylene	127184	6.10E-06	0.021		20000		35	
Styrene	100425				21000		900	
TCE	79016	2.00E-06	0.007				600	
Vinyl Chloride	75014	7.80E-05	0.27		180000			
H2S	7783064				42		10	

Table 5: Modeled Source Parameters

Source Type	Source Description (ID)	Location	Modeled Source Group	Number of Sources	Building Height (m)	Release Height (m)	Volume Lateral Width (m)	Initial Vertical Dimension (m)	Initial Vertical Dimension (m)	Exclusion Zone (m)	X/Q Emission Rate (g/s)
Volume	Maintenance Shop Heater	Maintenance	S13	1	16.8	16.8	50.0	11.63	7.80	25	1

Source Type	Source Description (ID)	Location	Modeled Source Group	Number of Sources	Release Height (m)	X Length (m)	Y Length (m)	Angle	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)	X/Q Emission Rate (g/s-m2)
Area	Sulfur Handling	Outside	S15	1	2	7.32	7.9248	0	—	1.86	0.01725

Source Type	Source Description (ID)	Location	Modeled Source Group	Number of Sources	Stack Height (m)	Stack Temp (K)	Stack Velocity (m/s)	Stack Diameter (m)	Release Type	X/Q Emission Rate (g/s-m2)
Point (uncapped)	Acid Plant #4	Outside	S1	1	39.62	296.54	11.2	1.83	Vertical	1
	Package Boiler	Outside	S2	1	15.20	533.15	6.9	0.88	Vertical	1
	Pre-Heater	Outside	S3	1	17.10	686.48	14.1	1.22	Capped	1
	Flare, Non-refinery	Outside	S4	1	15.20	1272.59	0.8	1.70	Vertical	1
	Air Compressor	Outside	S5	1	3.70	683.15	35.0	0.15	Vertical	1
	Heater	Change Room	S6	1	5.94	352.59	18.7	0.20	Capped	1
	Water Heater	Change Room	S7	1	5.79	310.93	0.001	0.15	Capped	1
Point (capped)	Heater	Office	S8	1	4.27	352.59	24.5	0.20	Capped	1
	Heater	Office	S9	1	4.27	352.59	24.5	0.20	Capped	1
	Heater	Office	S10	1	4.27	352.59	24.5	0.20	Capped	1
	Heater	Office	S11	1	4.27	352.59	24.5	0.20	Capped	1
	Heater	Office	S12	1	4.27	352.59	18.7	0.20	Capped	1
	Soil Vapor Extraction	Outside	S14	1	6.10	298.15	14.6	0.102	Horizontal	1

Table 6: Operating Assumptions by Source

Source	Hours/Day	Days/Week	Weeks/Yr	Comments
Acid Plant Furnace	24	7	50	The acid plant is shut down two weeks per year for O&M
AVS Flare	24	7	52	The flare operates continuously
Package Boiler	24	1	10	Operated at 50% of design capacity for 240 hours
Start-Up Heater	15	1	8	Operated intermittently, 120 hour/year in 2017
Space Heaters	8	7	26	Utilized from November through April on day shift only
Water Heater	24	7	52	Operates all months of the year
Diesel Air Compressor	2	1	1	Operates two hours per year for emergency testing
SVE System	24	7	28	The SVE was operational January through February and February through August in 2017
Sulfur Handling System	24	7	50	Sulfur deliveries are unscheduled and can occur during day or night hours

Table 7: Modeled Sensitive Receptors

Type of Sensitive Receptor	Name	Address	Distance from Facility	UTM Coordinates (m)
Parks/Recreation Centers	Dolphin Park (also has after-school program)	21205 Water Street	0.5	385010 E 3744732 N
	Mills Memorial Park	1340 E. Dimondale Drive	0.8	384619 E 3746038 N
	The Lab (basketball coaching facility)	1539 Del Amo Blvd	0.6	384804 E 3745895
Residential Homes	Nearest House N (1874-1864 Denwall)	E. Denwall Drive	0.2	385686 E 3745891 N
	Nearest House W (1723 Ballard)	Corner of Water and Ballard	0.4	385170 E 3745010 N
	Nearest Houses SW (21206-21200 Oakfort)	End of Oakfort	0.4	385368 E 3744796 N
Schools	Del Amo Elementary	21228 Water Street	0.5	385196 E 3744640 N
	Broadacres Ave School	19423 Broadacres	0.7	385410 E 3746673 N
Child Day Care Facilities	Peek-A-Boo Wee Care	1880 E Gladwick	0.5	385748 E 3746488 N
	Gates Family Daycare	1753 E. Dimondale	0.4	385345 E 3746088 N
	Dimondale Homes (Adolescent care 12-18)	1632 E. Dimondale	0.5	385126 E 3746038 N
Senior Care Facilities	Brighter Outlook (Adult Daycare)	2110 & 2112 E. Gladwick	0.6	386347 E 3746558 N
	Stevens Adult Homes	1857 E Abbottson	0.4	385649 E 3746312 N
	A & P Guest Home	1703 E. Albreda	0.6	385028 E 3744552 N

Table 8: PMI, MEIR, MEIW Annual Average Concentrations

Pollutant	CAS Number	Annual Average Concentrations (mg/mg3)				
		PMI/MEIW			MEIR	
		Cancer	8-hr Chronic	Chronic	Cancer	Chronic
		Rec # 1958 386083 E 3745335 N	Rec # 1959 386089 E 3745354 N	Rec # 509 385900 E 3745700 N	Rec #622 385800 E 3745950 N	Rec #622 385800 E 3745950 N
Acetaldehyde	75070	2.12E-05	2.18E-05	3.97E-05	1.63E-05	1.63E-05
Benzene	71432	1.11E-04	1.13E-04	9.06E-05	3.50E-05	3.50E-05
Ethyl Benzene	100414	3.22E-04	3.34E-04	2.98E-04	8.98E-05	8.98E-05
Formaldehyde	50000	1.45E-04	1.56E-04	3.00E-04	1.00E-04	1.00E-04
HCl	7647010	4.62E-03	4.74E-03	9.17E-03	4.06E-03	4.06E-03
Hexane	110543	2.77E-05	2.86E-05	5.30E-05	2.26E-05	2.26E-05
Napthalene	91203	2.40E-06	2.52E-06	4.78E-06	1.80E-06	1.80E-06
PAHs-w/o indiv. componen	1151	7.99E-07	8.28E-07	1.52E-06	5.88E-07	5.88E-07
Sulfuric Acid	7664939	7.13E-02	7.32E-02	1.42E-01	6.26E-02	6.26E-02
Toluene	108883	2.76E-04	2.80E-04	3.01E-04	1.30E-04	1.30E-04
Xylenes	1330207	2.89E-04	2.92E-04	2.29E-04	9.86E-05	9.86E-05
NH3	7664417	1.10E-03	1.13E-03	5.71E-04	1.92E-04	1.92E-04
1,3-Butadiene	106990	3.03E-07	2.46E-07	1.70E-07	8.31E-08	8.31E-08
Arsenic	7440382	2.23E-09	1.81E-09	1.25E-09	6.12E-10	6.12E-10
Cadmium	7440439	2.09E-09	1.70E-09	1.17E-09	5.73E-10	5.73E-10
Copper	7440508	5.72E-09	4.64E-09	3.21E-09	1.57E-09	1.57E-09
Cr(VI)	18540299	1.39E-10	1.13E-10	7.82E-11	3.82E-11	3.82E-11
DieselExhPM	9901	4.67E-05	3.79E-05	2.62E-05	1.28E-05	1.28E-05
Lead	7439921	1.16E-08	9.40E-09	6.49E-09	3.17E-09	3.17E-09
Manganese	7439965	4.32E-09	3.51E-09	2.42E-09	1.19E-09	1.19E-09
Mercury	7439976	2.79E-09	2.26E-09	1.56E-09	7.65E-10	7.65E-10
Nickel	7440020	5.44E-09	4.42E-09	3.05E-09	1.49E-09	1.49E-09
Selenium	7782492	3.07E-09	2.49E-09	1.72E-09	8.41E-10	8.41E-10
1,1,1-TCA	71556	2.37E-04	2.36E-04	2.09E-05	7.32E-06	7.32E-06
1,1-DiChloroEthane	75343	1.38E-04	1.37E-04	1.21E-05	4.25E-06	4.25E-06
CC14	56235	2.19E-04	2.18E-04	1.93E-05	6.76E-06	6.76E-06
Chloroform	67663	2.35E-04	2.35E-04	2.08E-05	7.28E-06	7.28E-06
Isopropyl Alcohol	67630	8.80E-04	8.78E-04	7.77E-05	2.72E-05	2.72E-05
Methylene Chloride	75092	1.61E-04	1.60E-04	1.42E-05	4.97E-06	4.97E-06
Perchloroethylene	127184	1.35E-02	1.35E-02	1.19E-03	4.17E-04	4.17E-04
Styrene	100425	1.71E-04	1.70E-04	1.51E-05	5.27E-06	5.27E-06
TCE	79016	1.90E-03	1.89E-03	1.67E-04	5.86E-05	5.86E-05
Vinyl Chloride	75014	8.12E-05	8.10E-05	7.17E-06	2.51E-06	2.51E-06
H2S	7783064	2.00E-01	1.82E-01	8.74E-02	3.27E-02	3.27E-02

Table 9: PMI, MEIR, MEIW, MEISR Hourly Average Concentrations

Pollutant	CAS Number	HourlyAverage Concentrations (ug/mg3)		
		PMI	MEIW	MEIR
		Acute		
		Rec # 1999 385735 E 3745469 N	Rec #438 385700 E 3745500 N	Rec #597 385700 E 3745900 N
Acetaldehyde	75070	2.22E-01	1.63E-01	2.73E-02
Benzene	71432	1.28E-01	1.07E-01	4.17E-02
Ethyl Benzene	100414	6.94E-01	6.31E-01	3.25E-01
Formaldehyde	50000	1.00E+00	8.25E-01	3.01E-01
HCl	7647010	1.87E-01	1.64E-01	1.14E-01
Hexane	110543	2.32E-02	1.98E-02	8.41E-03
Napthalene	91203	1.04E-02	8.48E-03	2.96E-03
PAHs-w/o indiv. components	1151	1.07E-02	7.94E-03	1.47E-03
Sulfuric Acid	7664939	1.82E+00	1.70E+00	1.43E+00
Toluene	108883	7.19E-02	6.06E-02	2.39E-02
Xylenes	1330207	3.87E-02	3.34E-02	1.42E-02
NH3	7664417	1.13E+00	1.04E+00	3.61E-01
1,3-Butadiene	106990	5.54E-02	3.96E-02	4.66E-03
Arsenic	7440382	4.08E-04	2.92E-04	3.43E-05
Cadmium	7440439	3.82E-04	2.73E-04	3.21E-05
Copper	7440508	1.04E-03	7.47E-04	8.79E-05
Cr(VI)	18540299	2.55E-05	1.82E-05	2.14E-06
DieselExhPM	9901	8.54E+00	6.10E+00	7.18E-01
Lead	7439921	2.11E-03	1.51E-03	1.78E-04
Manganese	7439965	7.90E-04	5.65E-04	6.64E-05
Mercury	7439976	5.10E-04	3.64E-04	4.29E-05
Nickel	7440020	9.94E-04	7.11E-04	8.36E-05
Selenium	7782492	5.61E-04	4.01E-04	4.71E-05
1,1,1-TCA	71556	3.91E-03	3.59E-03	1.27E-03
1,1-DiChloroEthane	75343	2.81E-03	2.58E-03	9.09E-04
CC14	56235	4.51E-03	4.14E-03	1.46E-03
Chloroform	67663	7.33E-03	6.73E-03	2.37E-03
Isopropyl Alcohol	67630	1.81E-02	1.66E-02	5.86E-03
Methylene Chloride	75092	2.91E-03	2.68E-03	9.44E-04
Perchloroethylene	127184	1.40E+00	1.29E+00	4.55E-01
Styrene	100425	3.11E-03	2.85E-03	1.01E-03
TCE	79016	1.81E-01	1.66E-01	5.86E-02
Vinyl Chloride	75014	1.81E-03	1.66E-03	5.86E-04
H2S	7783064	6.88E+01	4.08E+01	7.01E+00

Table 10: HARP2 Calculate Risk Options

HARP 2 Risk Analysis Screen Option Title*		Residential Cancer Risk	Residential Chronic Risk	Worker Cancer Risk	Worker Chronic Risk	Worker 8-hour Chronic Risk	Acute Risk
Risk Scenario	Analysis Type	Cancer Risk	Chronic Risk (Non-cancer)	Cancer Risk	Chronic Risk (Non-cancer)	8-hour Chronic Risk (Non-cancer)	Acute Risk (Non-Cancer)
	Receptor Type	Individual Resident	Individual Resident	Worker	Worker	Worker	Worker
	Exposure Duration	30 Year	N/A	25 Year	N/A	N/A	N/A
	Intake Rate Percentile	RMP Using the Derived Method	OEHHA Derived Method	OEHHA Derived Method	OEHHA Derived Method	N/A	N/A
Pathways to Evaluate	Tab "Pathways to Exposure"	User Defined: Inhalation, Soil Ingestion, Dermal, Mother's Milk and Home-grown Produce. Deposition rate of 0.02 m/s	User Defined: Inhalation, Soil Ingestion, Dermal, Mother's Milk and Home-grown Produce. Deposition rate of 0.02 m/s	Worker Pathways. Deposition Rate of 0.02 m/s	Worker Pathways. Deposition Rate of 0.02 m/s	Used Defaults (No Change)	Used Defaults (No Change)
	Tab "Inh"	Used Defaults (No Change)	Used Defaults (No Change)	Used Defaults (No Change)	Used Defaults (No Change)	Used Defaults (No Change)	Used Defaults (No Change)
	Tab "Soil"	Used Defaults (No Change)	Used Defaults (No Change)	Used Defaults (No Change)	N/A	N/A	N/A
	Tab "Derm"	Select a Climate: Warm	Select a Climate: Warm	Select a Climate: Warm	Select a Climate: Warm	N/A	N/A
	Tab "MMilk"	Used Defaults (No Change)	Used Defaults (No Change)	N/A	N/A	N/A	N/A
	Tab "HG Produce"	Used Defaults (No Change)	Used Defaults (No Change)	N/A	N/A	N/A	N/A

*Selected Options are based SCAQMD's AB2588 Protocol and Rule 1402 Supplemental Guidelines dated October 2020.

Table 11: Chronic and Acute Hazard Index Summary

Receptor Location	Value	Receptor Number	UTM Coordinates (WGS84)	
			Easting (m)	Northing (m)
Chronic Hazard Index				
Point of Maximum Impact (PMI)	0.15	509	385900	3745700
Maximally Exposed Individual Resident (MEIR)	0.067	622	385800	3745950
Maximally Exposed Individual Worker (MEIW)	0.15	509	385900	3745700
Substances Accounting for 90% of Chronic Hazard Index	Sulfuric Acid			
Processes Accounting for 90% of Chronic Hazard Index	Acid Plant Furnace			
Acute Hazard Index				
Point of Maximum Impact (PMI)	1.64	1999	385734	3745469
Maximally Exposed Individual Resident (MEIR)	0.17	597	385700	3745900
Maximally Exposed Individual Worker (MEIW)	0.97	438	385700	3745500
Substances Accounting for 90% of Acute Hazard Index	Hydrogen Sulfide			
Processes Accounting for 90% of Acute Hazard Index	Sulfur Handling			

Table 12: PMI, MEIR and MEIW Cancer Risk by Source

	PMI		MEIW		MEIR	
Source ID	Cancer Risk	Contribution	Cancer Risk	Contribution	Cancer Risk	Contribution
1	1.05E-09	4%	1.05E-09	4%	3.1E-08	54%
2	3.27E-11	0%	3.27E-11	0%	2.0E-10	0%
3	2.32E-11	0%	2.32E-11	0%	1.1E-10	0%
4	4.68E-10	2%	4.68E-10	2%	7.9E-09	14%
5	2.99E-09	12%	2.99E-09	12%	1.1E-08	18%
6	1.71E-12	0%	1.71E-12	0%	1.6E-11	0%
7	1.82E-12	0%	1.82E-12	0%	1.6E-11	0%
8	5.18E-13	0%	5.18E-13	0%	7.5E-12	0%
9	5.38E-13	0%	5.38E-13	0%	7.5E-12	0%
10	5.65E-13	0%	5.65E-13	0%	7.6E-12	0%
11	5.94E-13	0%	5.94E-13	0%	7.6E-12	0%
12	6.05E-13	0%	6.05E-13	0%	7.2E-12	0%
13	7.85E-12	0%	7.85E-12	0%	3.7E-11	0%
14	2.06E-08	82%	2.06E-08	82%	7.8E-09	13%
15	0	0%	0	0%	0	0%

* numbers may not add up to 100% due to rounding

Table 13: PMI Cancer Risk by Substance and Pathway

Receptor ID	x	y	CAS Number	Pollutant Abbreviation	Total Risk	Inhalation	Soil	Dermal	Contribution
1958	386083	3745335	75070	Acetaldehyde	1.19E-11	1.19E-11	0	0	0.0%
1958	386083	3745335	71432	Benzene	6.26E-10	6.26E-10	0	0	2.5%
1958	386083	3745335	100414	Ethyl Benzene	1.58E-10	1.58E-10	0	0	0.6%
1958	386083	3745335	50000	Formaldehyde	1.71E-10	1.71E-10	0	0	0.7%
1958	386083	3745335	7647010	HCl	0	0	0	0	0.0%
1958	386083	3745335	110543	Hexane	0	0	0	0	0.0%
1958	386083	3745335	91203	Napthalene	1.62E-11	1.62E-11	0	0	0.1%
1958	386083	3745335	1151	PAHs-w/o	1.16E-09	1.30E-10	5.52E-10	4.78E-10	4.6%
1958	386083	3745335	7664939	Sulfuric Acid	0	0	0	0	0.0%
1958	386083	3745335	108883	Toluene	0	0	0	0	0.0%
1958	386083	3745335	1330207	Xylenes	0	0	0	0	0.0%
1958	386083	3745335	7664417	NH3	0	0	0	0	0.0%
1958	386083	3745335	106990	1,3-Butadiene	1.02E-11	1.02E-11	0	0	0.0%
1958	386083	3745335	7440382	Arsenic	6.81E-12	1.11E-12	4.07E-12	1.63E-12	0.0%
1958	386083	3745335	7440439	Cadmium	1.77E-12	1.77E-12	0	0	0.0%
1958	386083	3745335	7440508	Copper	0	0	0	0	0.0%
1958	386083	3745335	18540299	Cr(VI)	4.09E-12	4.00E-12	8.47E-14	5.88E-15	0.0%
1958	386083	3745335	9901	DieselExhPM	2.89E-09	2.89E-09	0	0	11.5%
1958	386083	3745335	7439921	Lead	1.59E-13	2.74E-14	1.20E-13	1.24E-14	0.0%
1958	386083	3745335	7439965	Manganese	0	0	0	0	0.0%
1958	386083	3745335	7439976	Mercury	0	0	0	0	0.0%
1958	386083	3745335	7440020	Nickel	2.78E-13	2.78E-13	0	0	0.0%
1958	386083	3745335	7782492	Selenium	0	0	0	0	0.0%
1958	386083	3745335	71556	1,1,1-TCA	0	0	0	0	0.0%
1958	386083	3745335	75343	1,1-DiChloroEthane	4.41E-11	4.41E-11	0	0	0.2%
1958	386083	3745335	56235	CC14	1.84E-09	1.84E-09	0	0	7.3%
1958	386083	3745335	67663	Chloroform	2.52E-10	2.52E-10	0	0	1.0%
1958	386083	3745335	67630	Isopropyl Alcohol	0	0	0	0	0.0%
1958	386083	3745335	75092	Methylene Chloride	3.16E-11	3.16E-11	0	0	0.1%
1958	386083	3745335	127184	Perchloroethylene	1.59E-08	1.59E-08	0	0	63.4%
1958	386083	3745335	100425	Styrene	0	0	0	0	0.0%
1958	386083	3745335	79016	TCE	7.46E-10	7.46E-10	0	0	3.0%
1958	386083	3745335	75014	Vinyl Chloride	1.23E-09	1.23E-09	0	0	4.9%
1958	386083	3745335	7783064	H2S	0	0	0	0	0.0%

Table 14: MEIR Cancer Risk by Substance and Pathway

Receptor ID	x	y	CAS Number	Pollutant Abbreviation	Total Risk	Inhalation	Soil	Dermal	Mother's Milk	Homegrown Produce	Contribution
622	385800	3745950	75070	Acetaldehyde	1.13E-10	1.13E-10	0	0	0	0	0%
622	385800	3745950	71432	Benzene	2.41E-09	2.41E-09	0	0	0	0	4%
622	385800	3745950	100414	Ethyl Benzene	5.39E-10	5.39E-10	0	0	0	0	1%
622	385800	3745950	50000	Formaldehyde	1.45E-09	1.45E-09	0	0	0	0	2%
622	385800	3745950	7647010	HCl	0	0	0	0	0	0	0%
622	385800	3745950	110543	Hexane	0	0	0	0	0	0	0%
622	385800	3745950	91203	Napthalene	1.49E-10	1.49E-10	0	0	0	0	0%
622	385800	3745950	1151	PAHs-w/o	3.59E-08	1.12E-09	4.08E-09	1.02E-09	9.70E-09	2.00E-08	62%
622	385800	3745950	7664939	Sulfuric Acid	0	0	0	0	0	0	0%
622	385800	3745950	108883	Toluene	0	0	0	0	0	0	0%
622	385800	3745950	1330207	Xylenes	0	0	0	0	0	0	0%
622	385800	3745950	7664417	NH3	0	0	0	0	0	0	0%
622	385800	3745950	106990	1,3-Butadiene	3.44E-11	3.44E-11	0	0	0	0	0%
622	385800	3745950	7440382	Arsenic	4.83E-11	3.58E-12	2.64E-11	1.29E-12	0	1.70E-11	0%
622	385800	3745950	7440439	Cadmium	5.94E-12	5.94E-12	0	0	0	0	0%
622	385800	3745950	7440508	Copper	0	0	0	0	0	0	0%
622	385800	3745950	18540299	Cr(VI)	2.13E-11	1.35E-11	2.33E-13	8.94E-15	0	7.63E-12	0%
622	385800	3745950	9901	DieselExhPM	9.72E-09	9.72E-09	0	0	0	0	17%
622	385800	3745950	7439921	Lead	1.03E-12	6.51E-14	7.77E-13	1.89E-14	1.41E-14	1.56E-13	0%
622	385800	3745950	7439965	Manganese	0	0	0	0	0	0	0%
622	385800	3745950	7439976	Mercury	0	0	0	0	0	0	0%
622	385800	3745950	7440020	Nickel	9.36E-13	9.36E-13	0	0	0	0	0%
622	385800	3745950	7782492	Selenium	0	0	0	0	0	0	0%
622	385800	3745950	71556	1,1,1-TCA	0	0	0	0	0	0	0%
622	385800	3745950	75343	1,1-DiChloroEthane	1.67E-11	1.67E-11	0	0	0	0	0%
622	385800	3745950	56235	CC14	7.00E-10	7.00E-10	0	0	0	0	1%
622	385800	3745950	67663	Chloroform	9.54E-11	9.54E-11	0	0	0	0	0%
622	385800	3745950	67630	Isopropyl Alcohol	0	0	0	0	0	0	0%
622	385800	3745950	75092	Methylene Chloride	1.20E-11	1.20E-11	0	0	0	0	0%
622	385800	3745950	127184	Perchloroethylene	6.05E-09	6.05E-09	0	0	0	0	10%
622	385800	3745950	100425	Styrene	0	0	0	0	0	0	0%
622	385800	3745950	79016	TCE	2.83E-10	2.83E-10	0	0	0	0	0%
622	385800	3745950	75014	Vinyl Chloride	4.68E-10	4.68E-10	0	0	0	0	1%
622	385800	3745950	7783064	H2S	0	0	0	0	0	0	0%

Table 15: MEIW Cancer Risk by Substance and Pathway

Receptor ID	x	y	CAS Number	Pollutant Abbreviation	Total Risk	Inhalation	Soil	Dermal	Contribution
1958	386083	3745335	75070	Acetaldehyde	1.19E-11	1.19E-11	0	0	0.0%
1958	386083	3745335	71432	Benzene	6.26E-10	6.26E-10	0	0	2.5%
1958	386083	3745335	100414	Ethyl Benzene	1.58E-10	1.58E-10	0	0	0.6%
1958	386083	3745335	50000	Formaldehyde	1.71E-10	1.71E-10	0	0	0.7%
1958	386083	3745335	7647010	HCl	0	0	0	0	0.0%
1958	386083	3745335	110543	Hexane	0	0	0	0	0.0%
1958	386083	3745335	91203	Napthalene	1.62E-11	1.62E-11	0	0	0.1%
1958	386083	3745335	1151	PAHs-w/o	1.16E-09	1.30E-10	5.52E-10	4.78E-10	4.6%
1958	386083	3745335	7664939	Sulfuric Acid	0	0	0	0	0.0%
1958	386083	3745335	108883	Toluene	0	0	0	0	0.0%
1958	386083	3745335	1330207	Xylenes	0	0	0	0	0.0%
1958	386083	3745335	7664417	NH3	0	0	0	0	0.0%
1958	386083	3745335	106990	1,3-Butadiene	1.02E-11	1.02E-11	0	0	0.0%
1958	386083	3745335	7440382	Arsenic	6.81E-12	1.11E-12	4.07E-12	1.63E-12	0.0%
1958	386083	3745335	7440439	Cadmium	1.77E-12	1.77E-12	0	0	0.0%
1958	386083	3745335	7440508	Copper	0	0	0	0	0.0%
1958	386083	3745335	18540299	Cr(VI)	4.09E-12	4.00E-12	8.47E-14	5.88E-15	0.0%
1958	386083	3745335	9901	DieselExhPM	2.89E-09	2.89E-09	0	0	11.5%
1958	386083	3745335	7439921	Lead	1.59E-13	2.74E-14	1.20E-13	1.24E-14	0.0%
1958	386083	3745335	7439965	Manganese	0	0	0	0	0.0%
1958	386083	3745335	7439976	Mercury	0	0	0	0	0.0%
1958	386083	3745335	7440020	Nickel	2.78E-13	2.78E-13	0	0	0.0%
1958	386083	3745335	7782492	Selenium	0	0	0	0	0.0%
1958	386083	3745335	71556	1,1,1-TCA	0	0	0	0	0.0%
1958	386083	3745335	75343	1,1-DiChloroEthane	4.41E-11	4.41E-11	0	0	0.2%
1958	386083	3745335	56235	CC14	1.84E-09	1.84E-09	0	0	7.3%
1958	386083	3745335	67663	Chloroform	2.52E-10	2.52E-10	0	0	1.0%
1958	386083	3745335	67630	Isopropyl Alcohol	0	0	0	0	0.0%
1958	386083	3745335	75092	Methylene Chloride	3.16E-11	3.16E-11	0	0	0.1%
1958	386083	3745335	127184	Perchloroethylene	1.59E-08	1.59E-08	0	0	63.4%
1958	386083	3745335	100425	Styrene	0	0	0	0	0.0%
1958	386083	3745335	79016	TCE	7.46E-10	7.46E-10	0	0	3.0%
1958	386083	3745335	75014	Vinyl Chloride	1.23E-09	1.23E-09	0	0	4.9%
1958	386083	3745335	7783064	H2S	0	0	0	0	0.0%

Table 16: PMI, MEIR and MEIW Chronic HI by Source

Source ID	PMI		MEIW		MEIR	
	CHI	Contribution	CHI	Contribution	CHI	Contribution
1	1.43E-01	94%	1.43E-01	94%	6.31E-02	95%
2	1.62E-06	0%	1.62E-06	0%	5.06E-07	0%
3	8.91E-07	0%	8.91E-07	0%	2.77E-07	0%
4	1.89E-05	0%	1.89E-05	0%	4.70E-06	0%
5	8.06E-06	0%	8.06E-06	0%	6.37E-06	0%
6	9.53E-08	0%	9.53E-08	0%	4.04E-08	0%
7	1.18E-07	0%	1.18E-07	0%	4.14E-08	0%
8	3.23E-08	0%	3.23E-08	0%	1.91E-08	0%
9	3.34E-08	0%	3.34E-08	0%	1.92E-08	0%
10	3.46E-08	0%	3.46E-08	0%	1.94E-08	0%
11	3.58E-08	0%	3.58E-08	0%	1.96E-08	0%
12	3.59E-08	0%	3.59E-08	0%	1.85E-08	0%
13	2.37E-07	0%	2.37E-07	0%	9.44E-08	0%
14	3.46E-05	0%	3.46E-05	0%	1.21E-05	0%
15	8.74E-03	6%	8.74E-03	6%	3.27E-03	5%

TABLE 17: PMI Chronic HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL	INH_CONC	SOIL_DOSE	DERMAL_DOSE	MMILK_DOSE	CROP_DOSE	CONTRIBUTION
509	75070	Acetaldehyde	0	0	0	0	0	0	2.8E-07	0	0	0	0	0	0	0	4.0E-05	0	0	0	0	0.0%
	71432	Benzene	0	0	0	0	0	0	0	0	0	0	0	3.0E-05	0	0	9.1E-05	0	0	0	0	0.0%
	100414	Ethyl Benzene	0	0	0	1.5E-07	1.5E-07	1.5E-07	0	0	0	0	1.5E-07	0	0	0	3.0E-04	0	0	0	0	0.0%
	50000	Formaldehyde	0	0	0	0	0	0	3.3E-05	0	0	0	0	0	0	0	3.0E-04	0	0	0	0	0.0%
	7647010	HCl	0	0	0	0	0	0	1.0E-03	0	0	0	0	0	0	0	9.2E-03	0	0	0	0	0.7%
	110543	Hexane	0	7.6E-09	0	0	0	0	0	0	0	0	0	0	0	0	5.3E-05	0	0	0	0	0.0%
	91203	Napthalene	0	0	0	0	0	0	5.3E-07	0	0	0	0	0	0	0	4.8E-06	0	0	0	0	0.0%
	7664939	Sulfuric Acid	0	0	0	0	0	0	1.4E-01	0	0	0	0	0	0	0	1.4E-01	0	0	0	0	93.5%
	108883	Toluene	0	0	0	0	0	0	0	0	7.2E-07	0	0	0	0	0	3.0E-04	0	0	0	0	0.0%
	1330207	Xylenes	0	3.3E-07	0	0	0	0	3.3E-07	0	3.3E-07	0	0	0	0	0	2.3E-04	0	0	0	0	0.0%
	7664417	NH3	0	0	0	0	0	0	2.9E-06	0	0	0	0	0	0	0	5.7E-04	0	0	0	0	0.0%
	106990	1,3-Butadiene	0	0	0	0	0	8.5E-08	0	0	0	0	0	0	0	0	1.7E-07	0	0	0	0	0.0%
	7440382	Arsenic	2.4E-06	2.4E-06	0	0	0	2.4E-06	2.4E-06	2.4E-06	0	0	0	0	0	0	1.3E-09	6.2E-12	1.8E-12	0	0	0.0%
	7440439	Cadmium	0	0	0	7.0E-08	0	0	5.9E-08	0	0	0	0	0	0	0	1.2E-09	5.8E-12	5.5E-14	0	0	0.0%
	18540299	Cr(VI)	0	0	0	0	0	0	3.9E-10	0	0	0	0	2.1E-11	0	0	7.8E-11	3.9E-13	3.7E-14	0	0	0.0%
	9901	DieselExhPM	0	0	0	0	0	0	5.2E-06	0	0	0	0	0	0	0	2.6E-05	0	0	0	0	0.0%
	7439965	Manganese	0	2.7E-08	0	0	0	0	0	0	0	0	0	0	0	0	2.4E-09	0	0	0	0	0.0%
	7439976	Mercury	0	1.1E-07	0	1.1E-07	0	1.1E-07	0	0	0	0	0	0	0	0	1.6E-09	7.8E-12	1.5E-12	0	0	0.0%
	7440020	Nickel	0	0	0	0	0	1.5E-09	2.2E-07	0	0	0	0	2.2E-07	0	0	3.0E-09	1.5E-11	1.4E-12	0	0	0.0%
	7782492	Selenium	2.0E-09	2.0E-09	0	0	2.0E-09	0	0	0	0	0	0	0	0	0	1.7E-09	8.5E-12	1.2E-12	0	0	0.0%
	71556	1,1,1-TCA	0	2.1E-08	0	0	0	0	0	0	0	0	0	0	0	0	2.1E-05	0	0	0	0	0.0%
	56235	CC14	0	4.8E-07	0	0	4.8E-07	4.8E-07	0	0	0	0	0	0	0	0	1.9E-05	0	0	0	0	0.0%
	67663	Chloroform	0	0	0	6.9E-08	6.9E-08	6.9E-08	0	0	0	0	0	0	0	0	2.1E-05	0	0	0	0	0.0%
	67630	Isopropyl Alcohol	0	0	0	1.1E-08	0	1.1E-08	0	0	0	0	0	0	0	0	7.8E-05	0	0	0	0	0.0%
	75092	Methylene Chloride	3.5E-08	3.5E-08	0	0	0	0	0	0	0	0	0	0	0	0	1.4E-05	0	0	0	0	0.0%
	127184	Perchloroethylene	0	0	0	3.4E-05	3.4E-05	0	0	0	0	0	0	0	0	0	1.2E-03	0	0	0	0	0.0%
	100425	Styrene	0	1.7E-08	0	0	0	0	0	0	0	0	0	0	0	0	1.5E-05	0	0	0	0	0.0%
	79016	TCE	0	2.8E-07	0	0	0	0	0	0	2.8E-07	0	0	0	0	0	1.7E-04	0	0	0	0	0.0%
	7783064	H2S	0	0	0	0	0	0	8.7E-03	0	0	0	0	0	0	0	8.7E-02	0	0	0	0	5.8%

Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

TABLE 18: MEIR Chronic HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL	INH_CONC	SOIL_DOSE	DERMAL_DOSE	MMILK_DOSE	CROP_DOSE	CONTRIBUTION
622	75070	Acetaldehyde	0	0	0	0	0	0	1.2E-07	0	0	0	0	0	0	0	1.6E-05	0	0	0	0	0%
	71432	Benzene	0	0	0	0	0	0	0	0	0	0	0	1.2E-05	0	0	3.5E-05	0	0	0	0	0%
	100414	Ethyl Benzene	0	0	0	4.5E-08	4.5E-08	4.5E-08	0	0	0	0	4.5E-08	0	0	0	9.0E-05	0	0	0	0	0%
	50000	Formaldehyde	0	0	0	0	0	0	1.1E-05	0	0	0	0	0	0	0	1.0E-04	0	0	0	0	0%
	7647010	HCl	0	0	0	0	0	0	4.5E-04	0	0	0	0	0	0	0	4.1E-03	0	0	0	0	1%
	110543	Hexane	0	3.2E-09	0	0	0	0	0	0	0	0	0	0	0	0	2.3E-05	0	0	0	0	0%
	91203	Napthalene	0	0	0	0	0	0	2.0E-07	0	0	0	0	0	0	0	1.8E-06	0	0	0	0	0%
	7664939	Sulfuric Acid	0	0	0	0	0	0	6.3E-02	0	0	0	0	0	0	0	6.3E-02	0	0	0	0	94%
	108883	Toluene	0	0	0	0	0	0	0	0	3.1E-07	0	0	0	0	0	1.3E-04	0	0	0	0	0%
	1330207	Xylenes	0	1.4E-07	0	0	0	0	1.4E-07	0	1.4E-07	0	0	0	0	0	9.9E-05	0	0	0	0	0%
	7664417	NH3	0	0	0	0	0	0	9.6E-07	0	0	0	0	0	0	0	1.9E-04	0	0	0	0	0%
	106990	1,3-Butadiene	0	0	0	0	0	4.2E-08	0	0	0	0	0	0	0	0	8.3E-08	0	0	0	0	0%
	7440382	Arsenic	3.6E-06	3.6E-06	0	0	0	3.6E-06	3.6E-06	3.6E-06	0	0	0	0	0	0	6.1E-10	5.5E-12	4.0E-13	0	6.5E-12	0%
	7440439	Cadmium	0	0	0	5.7E-08	0	0	2.9E-08	0	0	0	0	0	0	0	5.7E-10	5.2E-12	1.3E-14	0	8.8E-12	0%
	18540299	Cr(VI)	0	0	0	0	0	0	1.9E-10	0	0	0	0	4.7E-10	0	0	3.8E-11	3.5E-13	8.4E-15	0	9.0E-12	0%
	9901	DieselExhPM	0	0	0	0	0	0	2.6E-06	0	0	0	0	0	0	0	1.3E-05	0	0	0	0	0%
	7439965	Manganese	0	1.3E-08	0	0	0	0	0	0	0	0	0	0	0	0	1.2E-09	0	0	0	0	0%
	7439976	Mercury	0	9.8E-08	0	9.8E-08	0	9.8E-08	0	0	0	0	0	0	0	0	7.6E-10	6.9E-12	3.3E-13	0	4.4E-12	0%
	7440020	Nickel	0	0	0	0	0	2.0E-09	1.1E-07	0	0	0	0	1.1E-07	0	0	1.5E-09	1.3E-11	3.3E-13	0	8.1E-12	0%
	7782492	Selenium	8.2E-09	8.2E-09	0	0	8.2E-09	0	0	0	0	0	0	0	0	0	8.4E-10	7.6E-12	2.8E-13	0	3.3E-11	0%
	71556	1,1,1-TCA	0	7.3E-09	0	0	0	0	0	0	0	0	0	0	0	0	7.3E-06	0	0	0	0	0%
	56235	CC14	0	1.7E-07	0	0	1.7E-07	1.7E-07	0	0	0	0	0	0	0	0	6.8E-06	0	0	0	0	0%
	67663	Chloroform	0	0	0	2.4E-08	2.4E-08	2.4E-08	0	0	0	0	0	0	0	0	7.3E-06	0	0	0	0	0%
	67630	Isopropyl Alcohol	0	0	0	3.9E-09	0	3.9E-09	0	0	0	0	0	0	0	0	2.7E-05	0	0	0	0	0%
	75092	Methylene Chloride	1.2E-08	1.2E-08	0	0	0	0	0	0	0	0	0	0	0	0	5.0E-06	0	0	0	0	0%
	127184	Perchloroethylene	0	0	0	1.2E-05	1.2E-05	0	0	0	0	0	0	0	0	0	4.2E-04	0	0	0	0	0%
	100425	Styrene	0	5.9E-09	0	0	0	0	0	0	0	0	0	0	0	0	5.3E-06	0	0	0	0	0%
	79016	TCE	0	9.8E-08	0	0	0	0	0	0	9.8E-08	0	0	0	0	0	5.9E-05	0	0	0	0	0%
	7783064	H2S	0	0	0	0	0	0	3.3E-03	0	0	0	0	0	0	0	3.3E-02	0	0	0	0	5%

Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

TABLE 19: MEIW Chronic HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL	INH_CONC	SOIL_DOSE	DERMAL_DOSE	MMILK_DOSE	CROP_DOSE	CONTRIBUTION
509	75070	Acetaldehyde	0	0	0	0	0	0	2.84E-07	0	0	0	0	0	0	0	3.97E-05	0	0	0	0	0.0%
	71432	Benzene	0	0	0	0	0	0	0	0	0	0	0	3.02E-05	0	0	9.06E-05	0	0	0	0	0.0%
	100414	Ethyl Benzene	0	0	0	1.49E-07	1.49E-07	1.49E-07	0	0	0	0	1.49E-07	0	0	0	2.98E-04	0	0	0	0	0.0%
	50000	Formaldehyde	0	0	0	0	0	0	3.33E-05	0	0	0	0	0	0	0	3.00E-04	0	0	0	0	0.0%
	7647010	HCl	0	0	0	0	0	0	1.02E-03	0	0	0	0	0	0	0	9.17E-03	0	0	0	0	0.7%
	110543	Hexane	0	7.57E-09	0	0	0	0	0	0	0	0	0	0	0	0	5.30E-05	0	0	0	0	0.0%
	91203	Napthalene	0	0	0	0	0	0	5.31E-07	0	0	0	0	0	0	0	4.78E-06	0	0	0	0	0.0%
	7664939	Sulfuric Acid	0	0	0	0	0	0	1.42E-01	0	0	0	0	0	0	0	1.42E-01	0	0	0	0	93.5%
	108883	Toluene	0	0	0	0	0	0	0	0	7.16E-07	0	0	0	0	0	3.01E-04	0	0	0	0	0.0%
	1330207	Xylenes	0	3.27E-07	0	0	0	0	3.27E-07	0	3.27E-07	0	0	0	0	0	2.29E-04	0	0	0	0	0.0%
	7664417	NH3	0	0	0	0	0	0	2.86E-06	0	0	0	0	0	0	0	5.71E-04	0	0	0	0	0.0%
	106990	1,3-Butadiene	0	0	0	0	0	8.50E-08	0	0	0	0	0	0	0	0	1.70E-07	0	0	0	0	0.0%
	7440382	Arsenic	2.37E-06	2.37E-06	0	0	0	2.37E-06	2.37E-06	2.37E-06	0	0	0	0	0	0	1.25E-09	6.21E-12	1.78E-12	0	0	0.0%
	7440439	Cadmium	0	0	0	7.04E-08	0	0	5.86E-08	0	0	0	0	0	0	0	1.17E-09	5.83E-12	5.55E-14	0	0	0.0%
	18540299	Cr(VI)	0	0	0	0	0	0	3.91E-10	0	0	0	0	2.13E-11	0	0	7.82E-11	3.88E-13	3.70E-14	0	0	0.0%
	9901	DieselExhPM	0	0	0	0	0	0	5.24E-06	0	0	0	0	0	0	0	2.62E-05	0	0	0	0	0.0%
	7439965	Manganese	0	2.69E-08	0	0	0	0	0	0	0	0	0	0	0	0	2.42E-09	0	0	0	0	0.0%
	7439976	Mercury	0	1.10E-07	0	1.10E-07	0	1.10E-07	0	0	0	0	0	0	0	0	1.56E-09	7.77E-12	1.48E-12	0	0	0.0%
	7440020	Nickel	0	0	0	0	0	1.51E-09	2.18E-07	0	0	0	0	2.18E-07	0	0	3.05E-09	1.51E-11	1.44E-12	0	0	0.0%
	7782492	Selenium	2.04E-09	2.04E-09	0	0	2.04E-09	0	0	0	0	0	0	0	0	0	1.72E-09	8.55E-12	1.22E-12	0	0	0.0%
	71556	1,1,1-TCA	0	2.09E-08	0	0	0	0	0	0	0	0	0	0	0	0	2.09E-05	0	0	0	0	0.0%
	56235	CC14	0	4.82E-07	0	0	4.82E-07	4.82E-07	0	0	0	0	0	0	0	0	1.93E-05	0	0	0	0	0.0%
	67663	Chloroform	0	0	0	6.93E-08	6.93E-08	6.93E-08	0	0	0	0	0	0	0	0	2.08E-05	0	0	0	0	0.0%
	67630	Isopropyl Alcohol	0	0	0	1.11E-08	0	1.11E-08	0	0	0	0	0	0	0	0	7.77E-05	0	0	0	0	0.0%
	75092	Methylene Chloride	3.55E-08	3.55E-08	0	0	0	0	0	0	0	0	0	0	0	0	1.42E-05	0	0	0	0	0.0%
	127184	Perchloroethylene	0	0	0	3.40E-05	3.40E-05	0	0	0	0	0	0	0	0	0	1.19E-03	0	0	0	0	0.0%
	100425	Styrene	0	1.67E-08	0	0	0	0	0	0	0	0	0	0	0	0	1.51E-05	0	0	0	0	0.0%
	79016	TCE	0	2.79E-07	0	0	0	0	0	0	2.79E-07	0	0	0	0	0	1.67E-04	0	0	0	0	0.0%
	7783064	H2S	0	0	0	0	0	0	8.74E-03	0	0	0	0	0	0	0	8.74E-02	0	0	0	0	5.8%

Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

Table 20: PMI, MEIW 8-Hour Chronic HI by Source

Source ID	PMI		MEIW	
	8HR CHI	Contribution	8HR CHI	Contribution
1	1.0E-05	28%	1.0E-05	28%
2	2.7E-07	1%	2.7E-07	1%
3	2.9E-07	1%	2.9E-07	1%
4	3.7E-06	10%	3.7E-06	10%
5	7.0E-08	0%	7.0E-08	0%
6	1.8E-08	0%	1.8E-08	0%
7	2.0E-08	0%	2.0E-08	0%
8	5.6E-09	0%	5.6E-09	0%
9	5.8E-09	0%	5.8E-09	0%
10	6.1E-09	0%	6.1E-09	0%
11	6.4E-09	0%	6.4E-09	0%
12	6.5E-09	0%	6.5E-09	0%
13	1.0E-07	0%	1.0E-07	0%
14	2.3E-05	60%	2.3E-05	60%
15	0.0E+00	0%	0.0E+00	0%

TABLE 21: PMI 8-Hour Chronic HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD
509	75070	Acetaldehyde	0	0	0	0	0	0	7.27E-08	0	0	0	0	0
	71432	Benzene	0	0	0	0	0	0	0	0	0	0	0	3.77E-05
	100414	Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
	50000	Formaldehyde	0	0	0	0	0	0	1.73E-05	0	0	0	0	0
	7647010	HCl	0	0	0	0	0	0	0	0	0	0	0	0
	110543	Hexane	0	0	0	0	0	0	0	0	0	0	0	0
	91203	Napthalene	0	0	0	0	0	0	0	0	0	0	0	0
	7664939	Sulfuric Acid	0	0	0	0	0	0	0	0	0	0	0	0
	108883	Toluene	0	0	0	0	0	0	0	0	3.37E-07	0	0	0
	1330207	Xylenes	0	0	0	0	0	0	0	0	0	0	0	0
	7664417	NH3	0	0	0	0	0	0	0	0	0	0	0	0
	106990	1,3-Butadiene	0	0	0	0	0	2.74E-08	0	0	0	0	0	0
	7440382	Arsenic	1.21E-07	1.21E-07	0	0	0	1.21E-07	1.21E-07	1.21E-07	0	0	0	0
	7440439	Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
	18540299	Cr(VI)	0	0	0	0	0	0	0	0	0	0	0	0
	9901	DieselExhPM	0	0	0	0	0	0	0	0	0	0	0	0
	7439965	Manganese	0	2.06E-08	0	0	0	0	0	0	0	0	0	0
	7439976	Mercury	0	3.77E-08	0	3.77E-08	0	3.77E-08	0	0	0	0	0	0
	7440020	Nickel	0	0	7.36E-08	0	0	0	7.36E-08	0	0	0	0	0
	7782492	Selenium	0	0	0	0	0	0	0	0	0	0	0	0
	71556	1,1,1-TCA	0	0	0	0	0	0	0	0	0	0	0	0
	56235	CC14	0	0	0	0	0	0	0	0	0	0	0	0
	67663	Chloroform	0	0	0	0	0	0	0	0	0	0	0	0
	67630	Isopropyl Alcohol	0	0	0	0	0	0	0	0	0	0	0	0
	75092	Methylene Chloride	0	0	0	0	0	0	0	0	0	0	0	0
	127184	Perchloroethylene	0	0	0	0	0	0	0	0	0	0	0	0
	100425	Styrene	0	0	0	0	0	0	0	0	0	0	0	0
	79016	TCE	0	0	0	0	0	0	0	0	0	0	0	0
	7783064	H2S	0	0	0	0	0	0	0	0	0	0	0	0

Abbreviations:

CV = cardiovascular system HI

CNS = central nervous system HI

IMMUN = immune system HI

Kidney = kidneys HI

GILV = gastrointestinal system and liver HI

REPRO/DEVEL = reproduction and developmental HI

RESP = respiratory system HI

SKIN = skin HI

EYE = eye HI

BONE/TEETH = bones and teeth HI

ENDO = endocrine system HI

BLOOD = blood HI

ODOR = response to odors HI

GENERAL = general toxicity HI

MAXHI = maximum hazard index

INH = inhalation

MMILK = mother's milk

TABLE 22: MEIW 8-Hour Chronic HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD
509	75070	Acetaldehyde	0	0	0	0	0	0	7.27E-08	0	0	0	0	0
	71432	Benzene	0	0	0	0	0	0	0	0	0	0	0	3.77E-05
	100414	Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
	50000	Formaldehyde	0	0	0	0	0	0	1.73E-05	0	0	0	0	0
	7647010	HCl	0	0	0	0	0	0	0	0	0	0	0	0
	110543	Hexane	0	0	0	0	0	0	0	0	0	0	0	0
	91203	Napthalene	0	0	0	0	0	0	0	0	0	0	0	0
	7664939	Sulfuric Acid	0	0	0	0	0	0	0	0	0	0	0	0
	108883	Toluene	0	0	0	0	0	0	0	0	3.37E-07	0	0	0
	1330207	Xylenes	0	0	0	0	0	0	0	0	0	0	0	0
	7664417	NH3	0	0	0	0	0	0	0	0	0	0	0	0
	106990	1,3-Butadiene	0	0	0	0	0	2.74E-08	0	0	0	0	0	0
	7440382	Arsenic	1.21E-07	1.21E-07	0	0	0	1.21E-07	1.21E-07	1.21E-07	0	0	0	0
	7440439	Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
	18540299	Cr(VI)	0	0	0	0	0	0	0	0	0	0	0	0
	9901	DieselExhPM	0	0	0	0	0	0	0	0	0	0	0	0
	7439965	Manganese	0	2.06E-08	0	0	0	0	0	0	0	0	0	0
	7439976	Mercury	0	3.77E-08	0	3.77E-08	0	3.77E-08	0	0	0	0	0	0
	7440020	Nickel	0	0	7.36E-08	0	0	0	7.36E-08	0	0	0	0	0
	7782492	Selenium	0	0	0	0	0	0	0	0	0	0	0	0
	71556	1,1,1-TCA	0	0	0	0	0	0	0	0	0	0	0	0
	56235	CC14	0	0	0	0	0	0	0	0	0	0	0	0
	67663	Chloroform	0	0	0	0	0	0	0	0	0	0	0	0
	67630	Isopropyl Alcohol	0	0	0	0	0	0	0	0	0	0	0	0
	75092	Methylene Chloride	0	0	0	0	0	0	0	0	0	0	0	0
	127184	Perchloroethylene	0	0	0	0	0	0	0	0	0	0	0	0
	100425	Styrene	0	0	0	0	0	0	0	0	0	0	0	0
	79016	TCE	0	0	0	0	0	0	0	0	0	0	0	0
	7783064	H2S	0	0	0	0	0	0	0	0	0	0	0	0

Abbreviations:

CV = cardiovascular system HI

CNS = central nervous system HI

IMMUN = immune system HI

Kidney = kidneys HI

GILV = gastrointestinal system and liver HI

REPRO/DEVEL = reproduction and developmental HI

RESP = respiratory system HI

SKIN = skin HI

EYE = eye HI

BONE/TEETH = bones and teeth HI

ENDO = endocrine system HI

BLOOD = blood HI

ODOR = response to odors HI

GENERAL = general toxicity HI

MAXHI = maximum hazard index

INH = inhalation

MMILK = mother's milk

Table 23: PMI, MEIR, MEIW Acute HI by Source

Source ID	PMI		MEIR		MEIW	
	AHI	Contribution	AHI	Contribution	AHI	Contribution
1	1.5E-06	0%	1.16E-06	0%	1.4E-06	0%
2	8.8E-07	0%	4.08E-07	0%	1.0E-06	0%
3	4.2E-07	0%	2.24E-07	0%	3.6E-07	0%
4	6.1E-06	0%	2.88E-06	0%	5.6E-06	0%
5	2.9E-03	0%	2.43E-04	0%	2.1E-03	0%
6	4.8E-08	0%	3.55E-09	0%	3.4E-08	0%
7	2.7E-07	0%	3.02E-09	0%	1.6E-07	0%
8	6.3E-08	0%	3.45E-09	0%	4.8E-08	0%
9	6.4E-08	0%	3.41E-09	0%	4.7E-08	0%
10	6.4E-08	0%	3.40E-09	0%	4.9E-08	0%
11	6.6E-08	0%	3.38E-09	0%	5.3E-08	0%
12	6.7E-08	0%	3.02E-09	0%	4.9E-08	0%
13	5.3E-08	0%	2.28E-08	0%	4.5E-08	0%
14	1.2E-04	0%	3.96E-05	0%	1.1E-04	0%
15	1.6E+00	100%	0.17	100%	0.97	100%

TABLE 24: PMI Acute HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD
1999	75070	Acetaldehyde	0	0	0	0	0	0	4.72E-04	0	4.72E-04	0	0	0
	71432	Benzene	0	0	4.73E-03	0	0	4.73E-03	0	0	0	0	0	4.73E-03
	100414	Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
	50000	Formaldehyde	0	0	0	0	0	0	0	0	1.82E-02	0	0	0
	7647010	HCl	0	0	0	0	0	0	8.91E-05	0	8.91E-05	0	0	0
	110543	Hexane	0	0	0	0	0	0	0	0	0	0	0	0
	91203	Napthalene	0	0	0	0	0	0	0	0	0	0	0	0
	7664939	Sulfuric Acid	0	0	0	0	0	0	1.52E-02	0	0	0	0	0
	108883	Toluene	0	1.44E-05	0	0	0	0	1.44E-05	0	1.44E-05	0	0	0
	1330207	Xylenes	0	1.76E-06	0	0	0	0	1.76E-06	0	1.76E-06	0	0	0
	7664417	NH3	0	0	0	0	0	0	3.55E-04	0	3.55E-04	0	0	0
	106990	1,3-Butadiene	0	0	0	0	0	8.39E-05	0	0	0	0	0	0
	7440382	Arsenic	2.04E-03	2.04E-03	0	0	0	2.04E-03	0	0	0	0	0	0
	7440439	Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
	18540299	Cr(VI)	0	0	0	0	0	0	0	0	0	0	0	0
	9901	DieselExhPM	0	0	0	0	0	0	0	0	0	0	0	0
	7439965	Manganese	0	0	0	0	0	0	0	0	0	0	0	0
	7439976	Mercury	0	8.49E-04	0	0	0	8.49E-04	0	0	0	0	0	0
	7440020	Nickel	0	0	4.97E-03	0	0	0	0	0	0	0	0	0
	7782492	Selenium	0	0	0	0	0	0	0	0	0	0	0	0
	71556	1,1,1-TCA	0	5.75E-08	0	0	0	0	0	0	0	0	0	0
	56235	CC14	0	2.37E-06	0	0	2.37E-06	2.37E-06	0	0	0	0	0	0
	67663	Chloroform	0	4.89E-05	0	0	0	4.89E-05	4.89E-05	0	0	0	0	0
	67630	Isopropyl Alcohol	0	0	0	0	0	0	5.66E-06	0	5.66E-06	0	0	0
	75092	Methylene Chloride	2.08E-07	2.08E-07	0	0	0	0	0	0	0	0	0	0
	127184	Perchloroethylene	0	7.02E-05	0	0	0	0	7.02E-05	0	7.02E-05	0	0	0
	100425	Styrene	0	0	0	0	0	1.48E-07	1.48E-07	0	1.48E-07	0	0	0
	79016	TCE	0	0	0	0	0	0	0	0	0	0	0	0
	7783064	H2S	0	1.64E+00	0	0	0	0	0	0	0	0	0	0

Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

TABLE 25: MEIW Acute HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD
438	75070	Acetaldehyde	0	0	0	0	0	0	3.47E-04	0	3.47E-04	0	0	0
	71432	Benzene	0	0	3.96E-03	0	0	3.96E-03	0	0	0	0	0	3.96E-03
	100414	Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
	50000	Formaldehyde	0	0	0	0	0	0	0	0	1.50E-02	0	0	0
	7647010	HCl	0	0	0	0	0	0	7.81E-05	0	7.81E-05	0	0	0
	110543	Hexane	0	0	0	0	0	0	0	0	0	0	0	0
	91203	Napthalene	0	0	0	0	0	0	0	0	0	0	0	0
	7664939	Sulfuric Acid	0	0	0	0	0	0	1.41E-02	0	0	0	0	0
	108883	Toluene	0	1.21E-05	0	0	0	0	1.21E-05	0	1.21E-05	0	0	0
	1330207	Xylenes	0	1.52E-06	0	0	0	0	1.52E-06	0	1.52E-06	0	0	0
	7664417	NH3	0	0	0	0	0	0	3.26E-04	0	3.26E-04	0	0	0
	106990	1,3-Butadiene	0	0	0	0	0	6.00E-05	0	0	0	0	0	0
	7440382	Arsenic	1.46E-03	1.46E-03	0	0	0	1.46E-03	0	0	0	0	0	0
	7440439	Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
	18540299	Cr(VI)	0	0	0	0	0	0	0	0	0	0	0	0
	9901	DieselExhPM	0	0	0	0	0	0	0	0	0	0	0	0
	7439965	Manganese	0	0	0	0	0	0	0	0	0	0	0	0
	7439976	Mercury	0	6.07E-04	0	0	0	6.07E-04	0	0	0	0	0	0
	7440020	Nickel	0	0	3.55E-03	0	0	0	0	0	0	0	0	0
	7782492	Selenium	0	0	0	0	0	0	0	0	0	0	0	0
	71556	1,1,1-TCA	0	5.28E-08	0	0	0	0	0	0	0	0	0	0
	56235	CC14	0	2.18E-06	0	0	2.18E-06	2.18E-06	0	0	0	0	0	0
	67663	Chloroform	0	4.49E-05	0	0	0	4.49E-05	4.49E-05	0	0	0	0	0
	67630	Isopropyl Alcohol	0	0	0	0	0	0	5.20E-06	0	5.20E-06	0	0	0
	75092	Methylene Chloride	1.91E-07	1.91E-07	0	0	0	0	0	0	0	0	0	0
	127184	Perchloroethylene	0	6.45E-05	0	0	0	0	6.45E-05	0	6.45E-05	0	0	0
	100425	Styrene	0	0	0	0	0	1.36E-07	1.36E-07	0	1.36E-07	0	0	0
	79016	TCE	0	0	0	0	0	0	0	0	0	0	0	0
	7783064	H2S	0	9.72E-01	0	0	0	0	0	0	0	0	0	0

Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

TABLE 26: MEIR Acute HI By Substance

Receptor ID	CAS Number	Chemical Name	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD
597	75070	Acetaldehyde	0	0	0	0	0	0	5.80E-05	0	5.80E-05	0	0	0
	71432	Benzene	0	0	1.54E-03	0	0	1.54E-03	0	0	0	0	0	1.54E-03
	100414	Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
	50000	Formaldehyde	0	0	0	0	0	0	0	0	5.48E-03	0	0	0
	7647010	HCl	0	0	0	0	0	0	5.41E-05	0	5.41E-05	0	0	0
	110543	Hexane	0	0	0	0	0	0	0	0	0	0	0	0
	91203	Napthalene	0	0	0	0	0	0	0	0	0	0	0	0
	7664939	Sulfuric Acid	0	0	0	0	0	0	1.19E-02	0	0	0	0	0
	108883	Toluene	0	4.79E-06	0	0	0	0	4.79E-06	0	4.79E-06	0	0	0
	1330207	Xylenes	0	6.47E-07	0	0	0	0	6.47E-07	0	6.47E-07	0	0	0
	7664417	NH3	0	0	0	0	0	0	1.13E-04	0	1.13E-04	0	0	0
	106990	1,3-Butadiene	0	0	0	0	0	7.06E-06	0	0	0	0	0	0
	7440382	Arsenic	1.71E-04	1.71E-04	0	0	0	1.71E-04	0	0	0	0	0	0
	7440439	Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
	18540299	Cr(VI)	0	0	0	0	0	0	0	0	0	0	0	0
	9901	DieselExhPM	0	0	0	0	0	0	0	0	0	0	0	0
	7439965	Manganese	0	0	0	0	0	0	0	0	0	0	0	0
	7439976	Mercury	0	7.14E-05	0	0	0	7.14E-05	0	0	0	0	0	0
	7440020	Nickel	0	0	4.18E-04	0	0	0	0	0	0	0	0	0
	7782492	Selenium	0	0	0	0	0	0	0	0	0	0	0	0
	71556	1,1,1-TCA	0	1.86E-08	0	0	0	0	0	0	0	0	0	0
	56235	CC14	0	7.69E-07	0	0	7.69E-07	7.69E-07	0	0	0	0	0	0
	67663	Chloroform	0	1.58E-05	0	0	0	1.58E-05	1.58E-05	0	0	0	0	0
	67630	Isopropyl Alcohol	0	0	0	0	0	0	1.83E-06	0	1.83E-06	0	0	0
	75092	Methylene Chloride	6.74E-08	6.74E-08	0	0	0	0	0	0	0	0	0	0
	127184	Perchloroethylene	0	2.27E-05	0	0	0	0	2.27E-05	0	2.27E-05	0	0	0
	100425	Styrene	0	0	0	0	0	4.79E-08	4.79E-08	0	4.79E-08	0	0	0
	79016	TCE	0	0	0	0	0	0	0	0	0	0	0	0
	7783064	H2S	0	1.67E-01	0	0	0	0	0	0	0	0	0	0

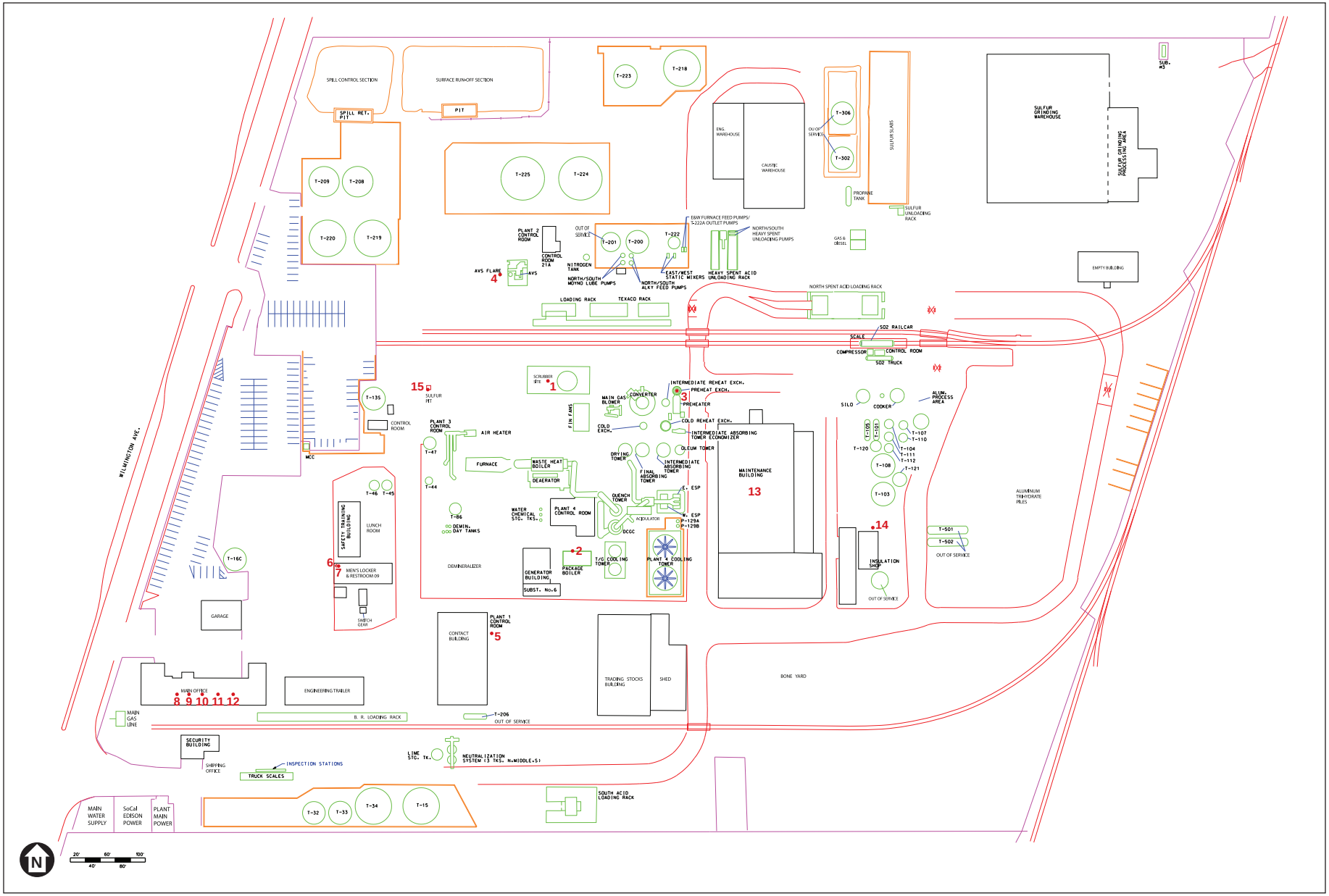
Abbreviations:

CV = cardiovascular system HI
CNS = central nervous system HI
IMMUN = immune system HI
Kidney = kidneys HI
GILV = gastrointestinal system and liver HI
REPRO/DEVEL = reproduction and developmental HI
RESP = respiratory system HI
SKIN = skin HI
EYE = eye HI
BONE/TEETH = bones and teeth HI
ENDO = endocrine system HI
BLOOD = blood HI
ODOR = response to odors HI
GENERAL = general toxicity HI
MAXHI = maximum hazard index
INH = inhalation
MMILK = mother's milk

Appendix B
Figures

Ecoservices AB 2588 Health Risk Assessment

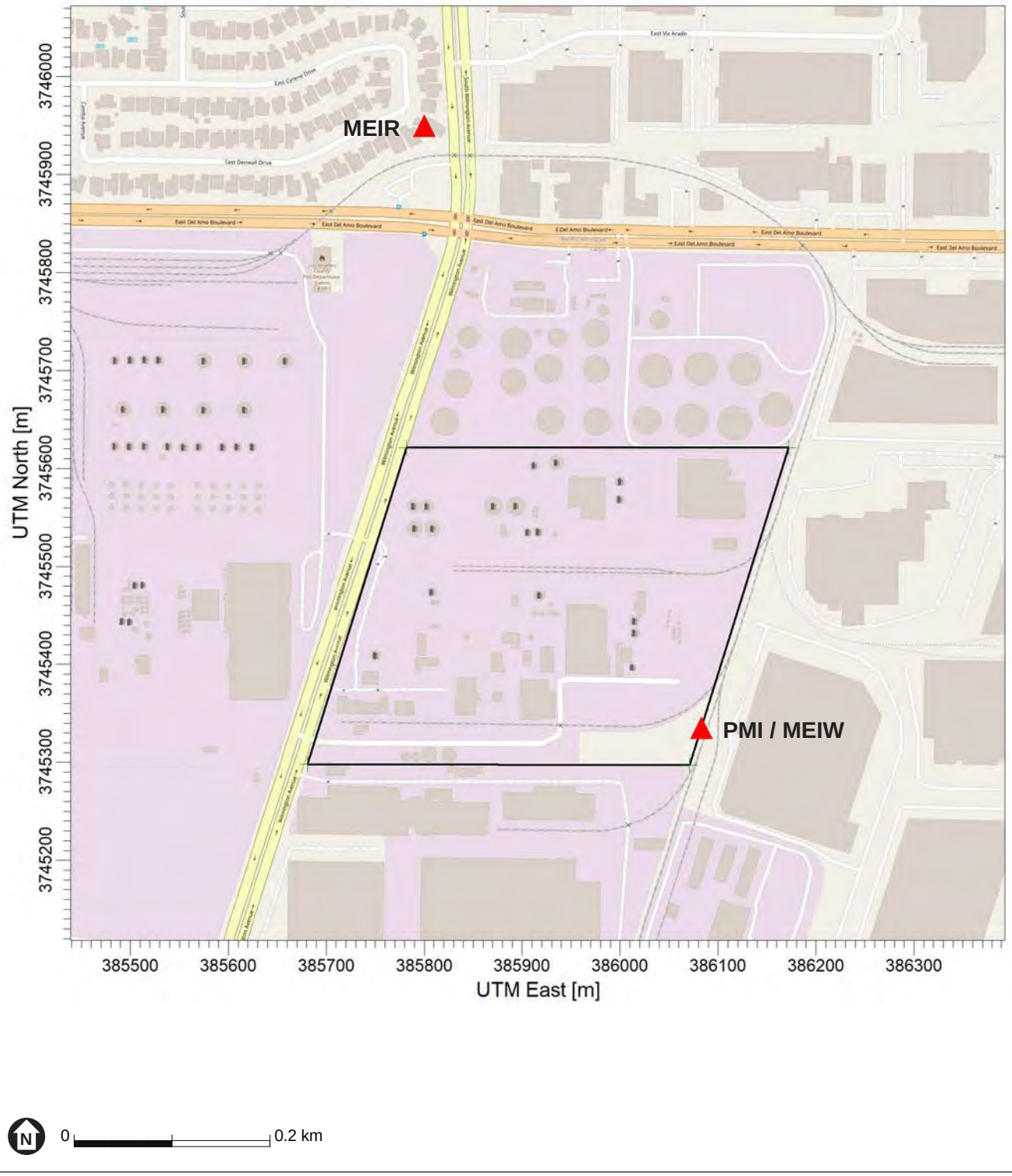
Figure ES-1
Vicinity Map



SOURCE: Ecoservices, 2021

Ecoservices AB 2588 Health Risk Assessment

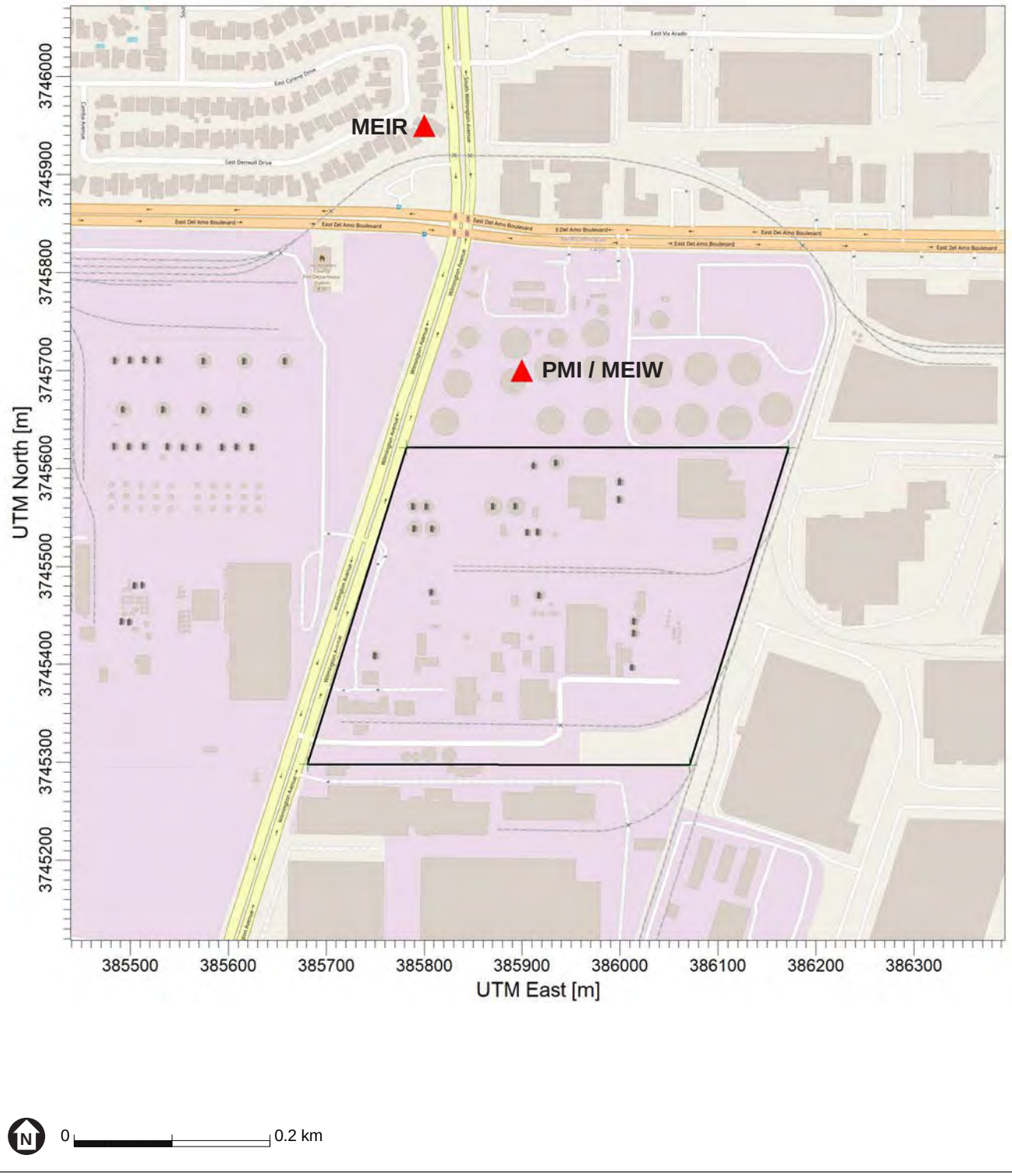
Figure ES-2
Site Plot Plan with Sources and Buildings



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

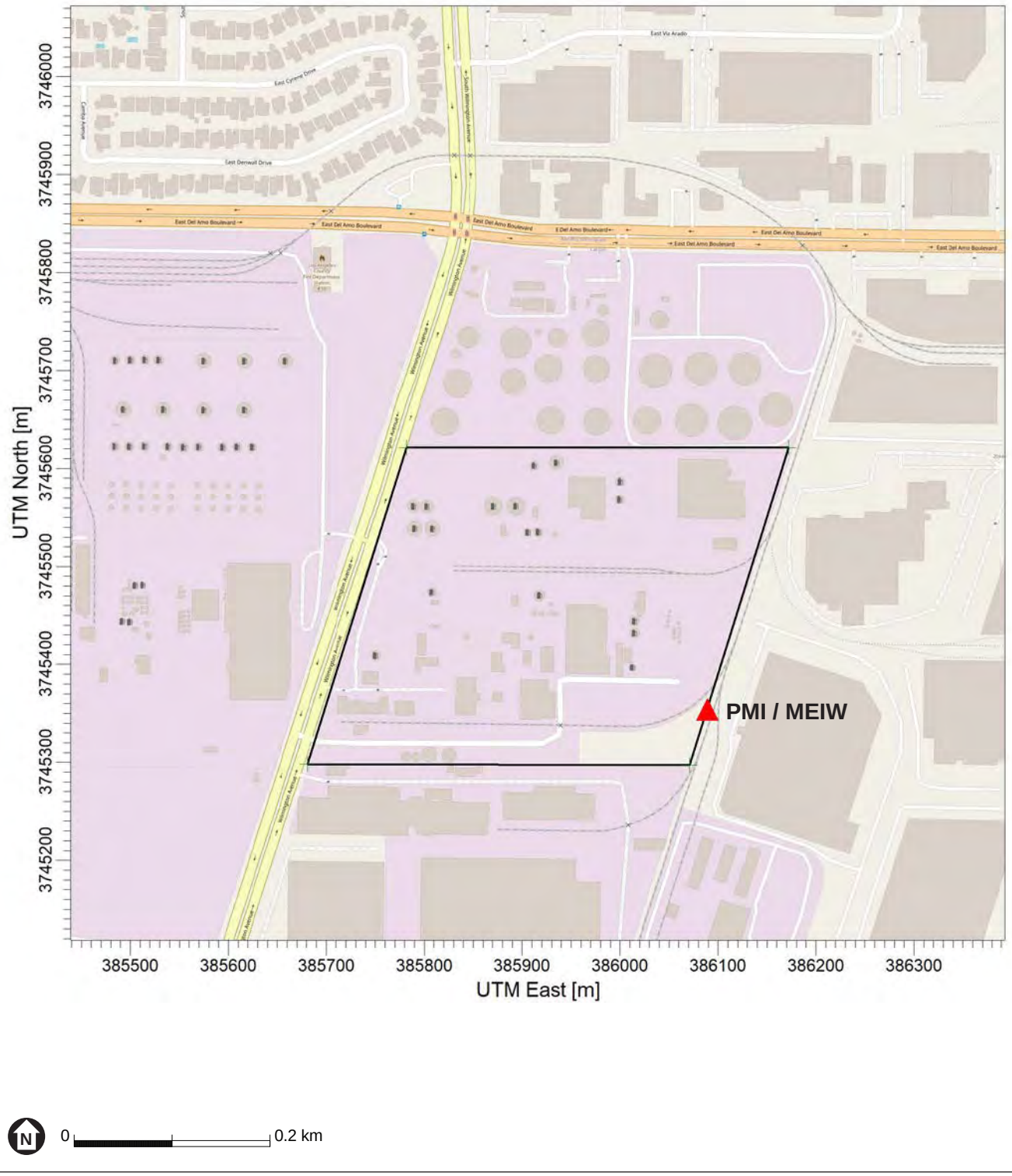
Figure ES-3
Locations of MEIR, MEIW and PMI for Cancer Risk



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

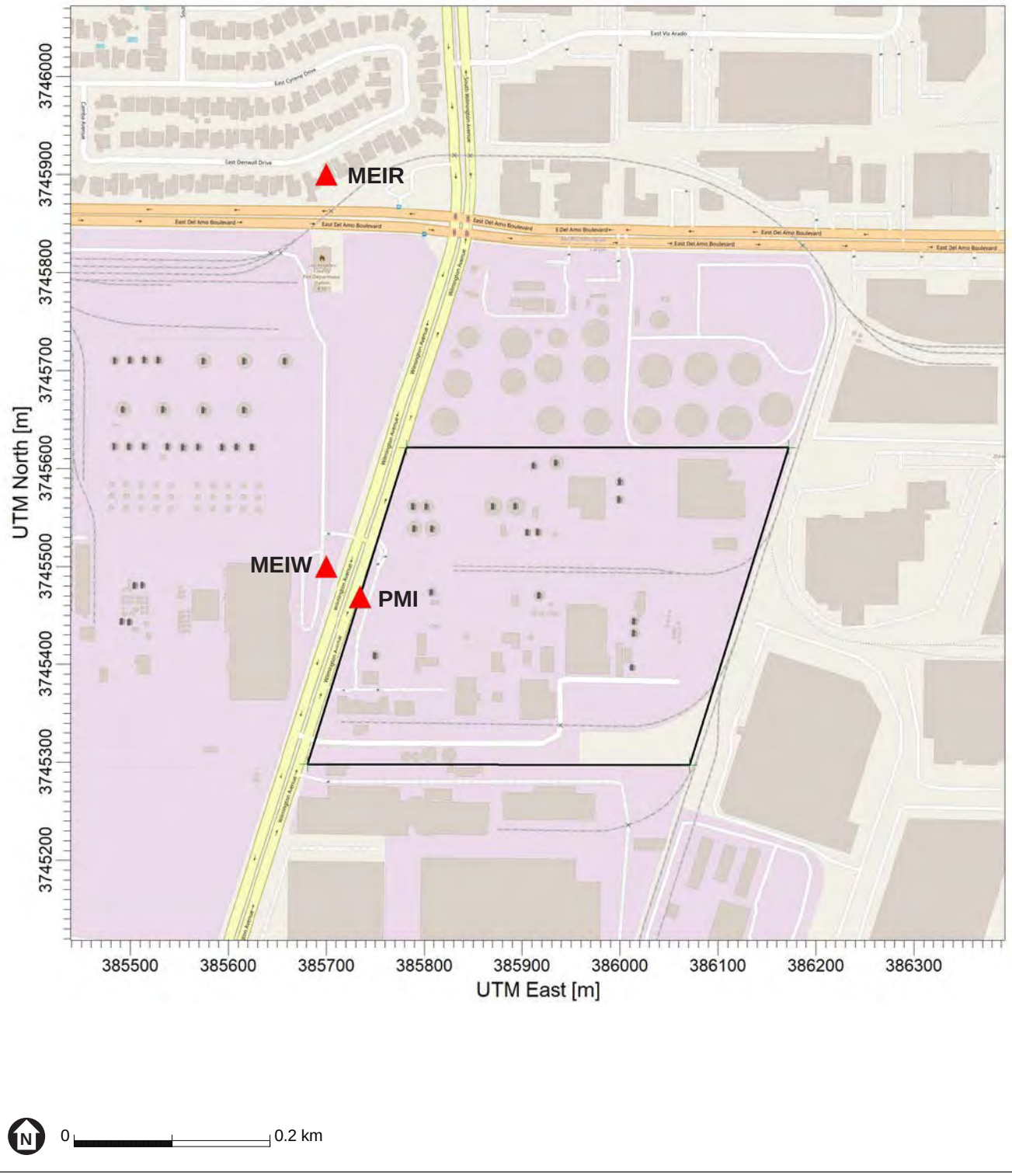
Figure ES-4
Locations of MEIR, MEIW and PMI for Chronic Hazard Index



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

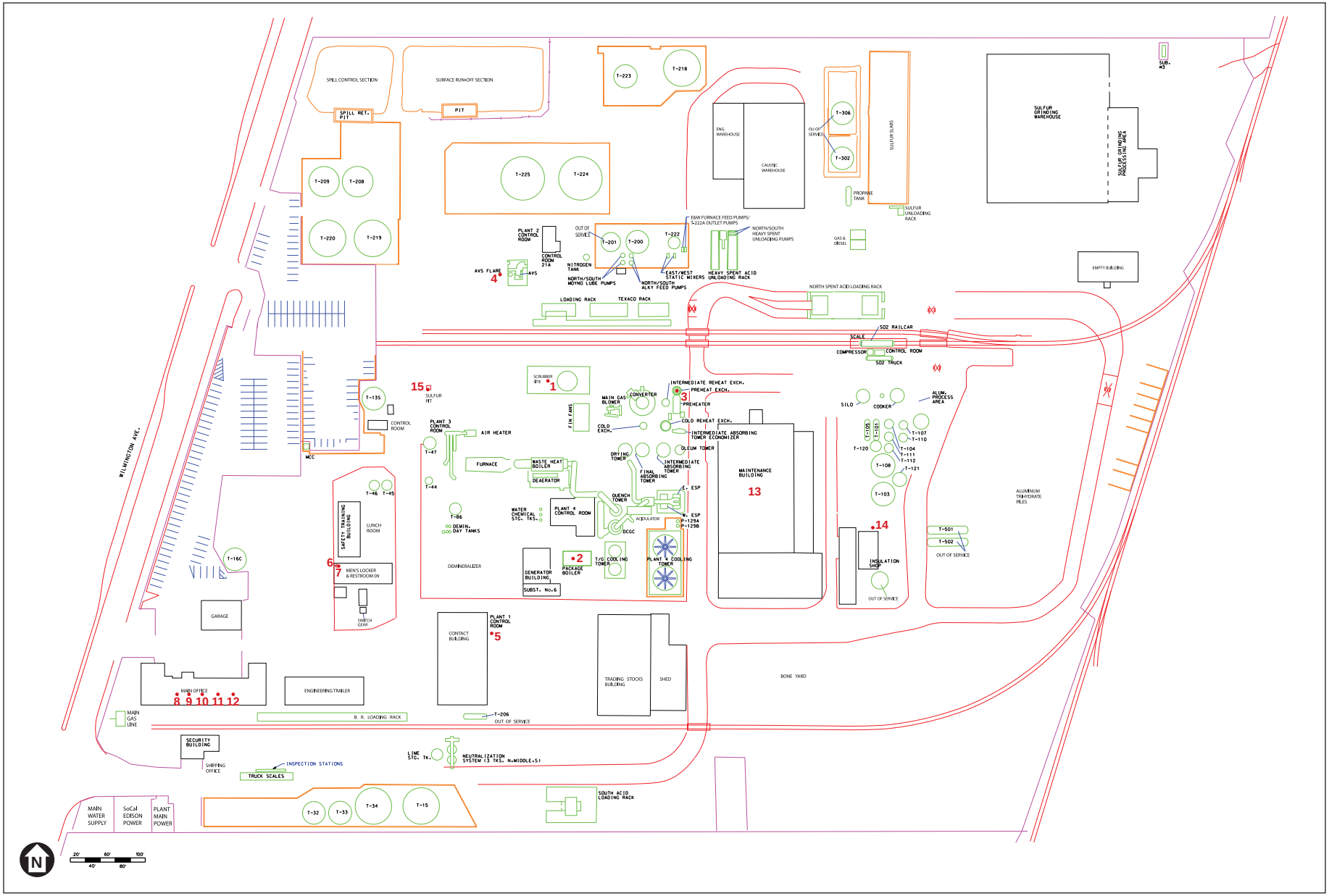
Figure ES-5
Locations of MEIW and PMI for 8-hr Chronic Hazard Index



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

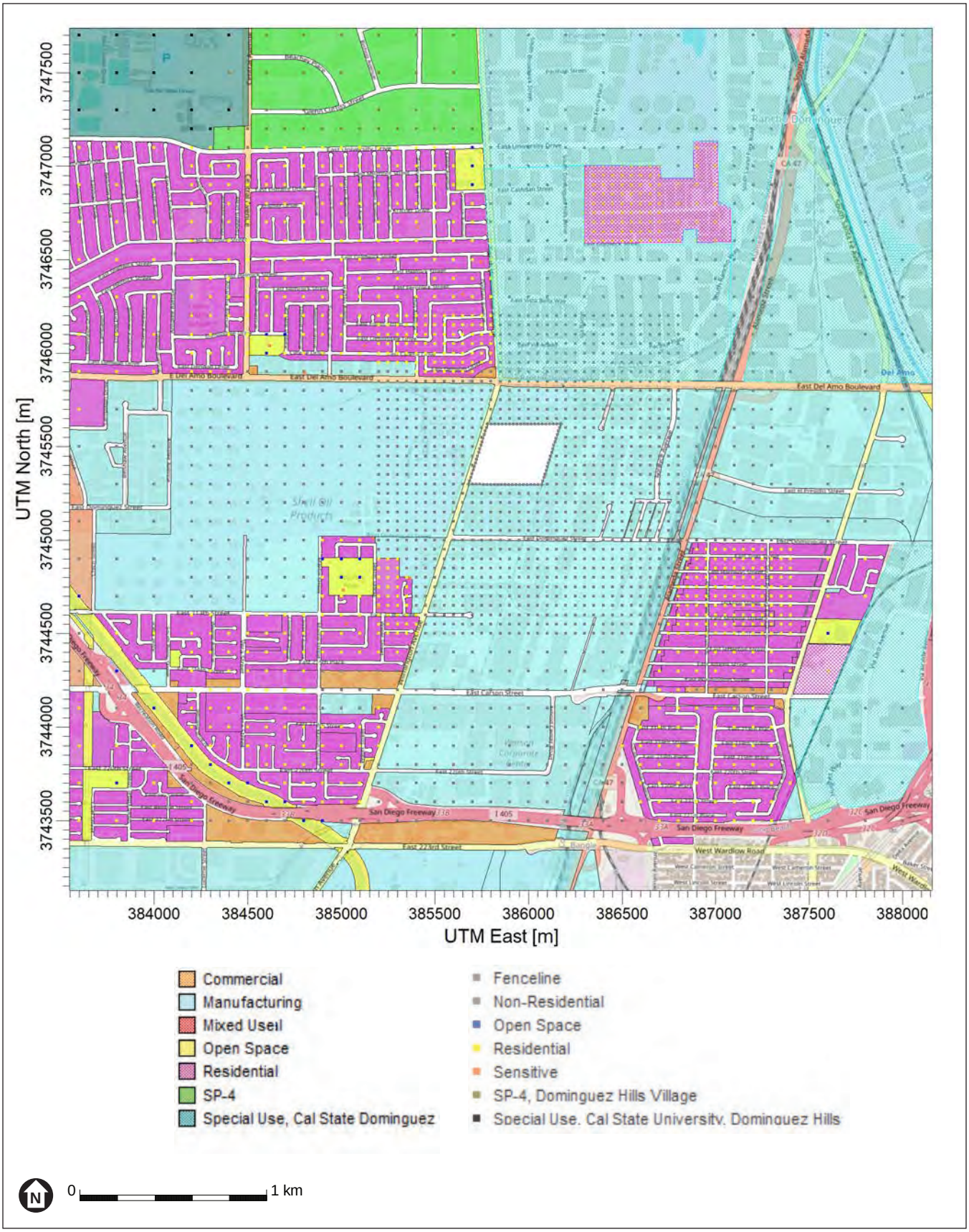
Figure ES-6
Locations of MEIR, MEIW and PMI for Acute Hazard Index



SOURCE: Ecoservices, 2021

Ecoservices AB 2588 Health Risk Assessment

Figure 1
Site Plot Plan with Sources and Buildings



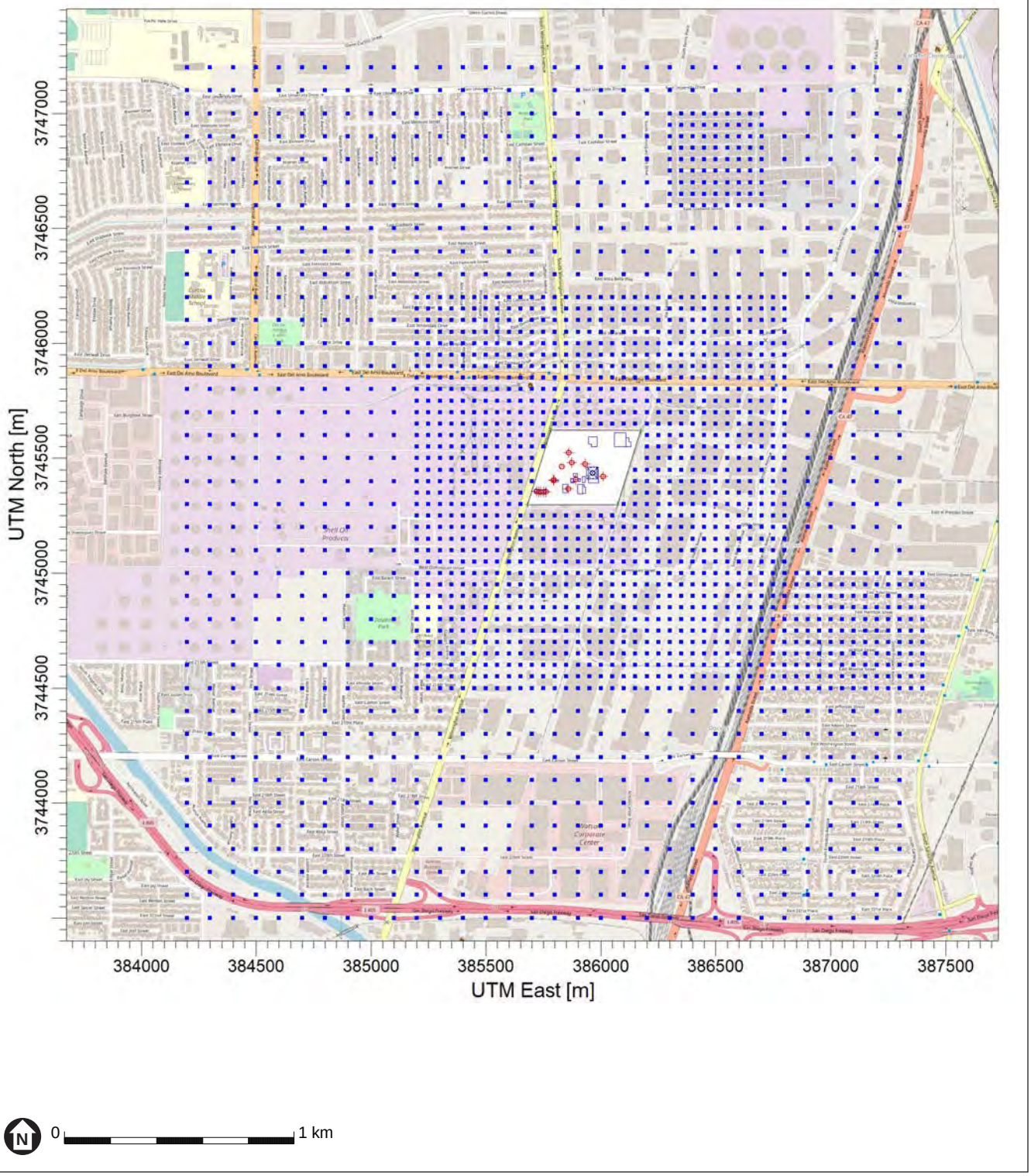
SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

Figure 2
Receptor Grid with Land Use Overlay

Ecoservices AB 2588 Health Risk Assessment

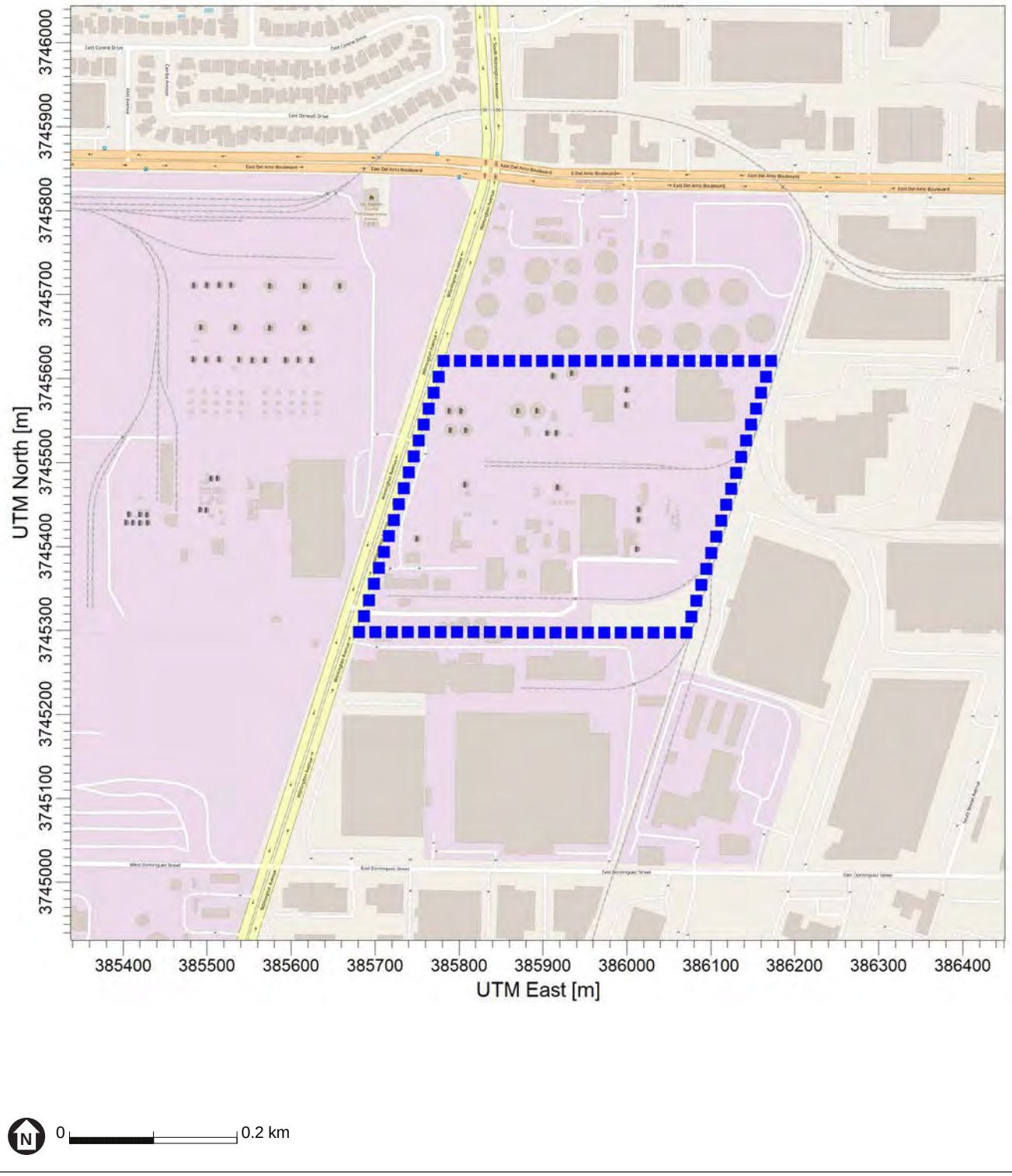
Figure 3
Receptors (200 Meter Grid Extent)



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

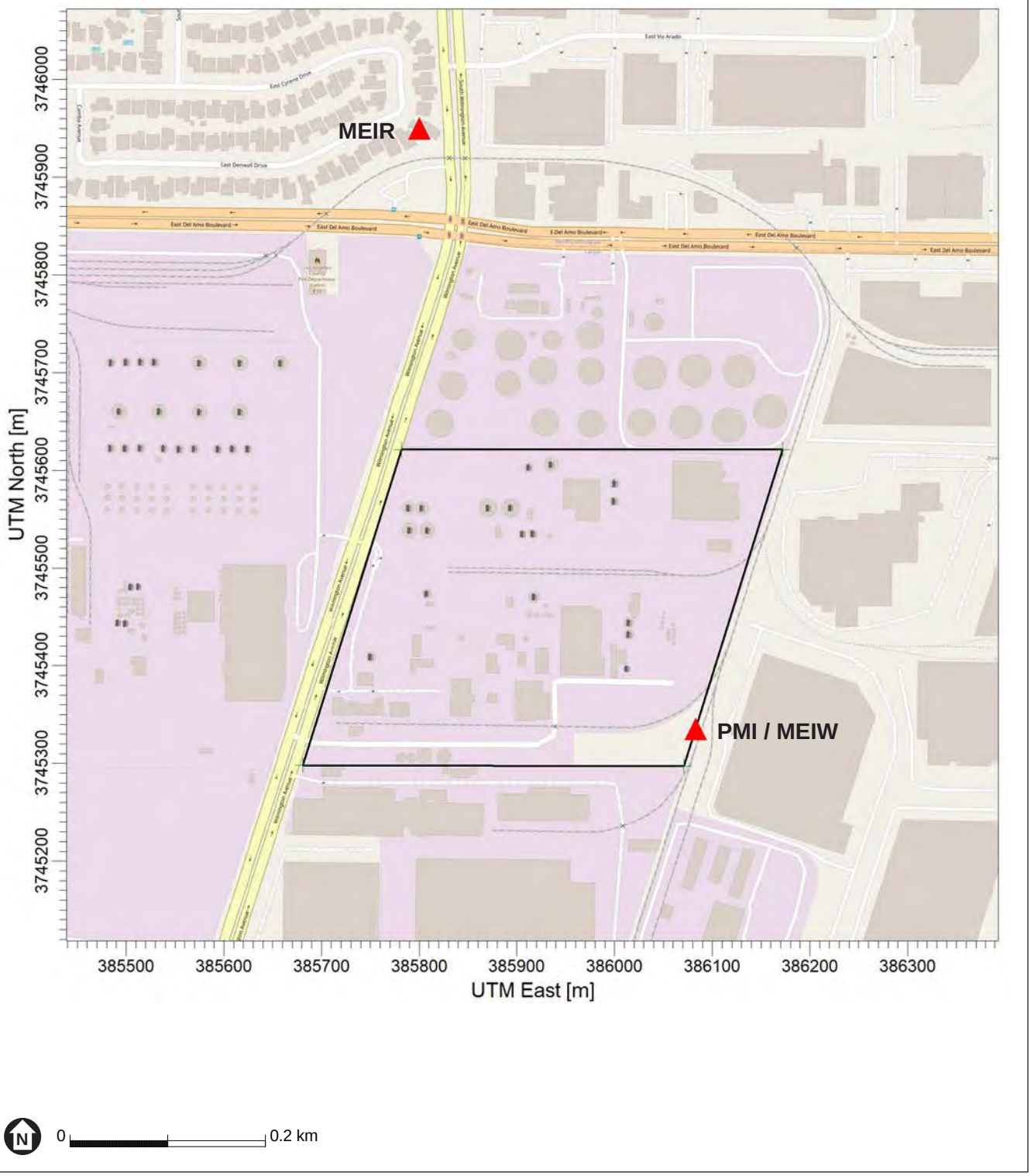
Figure 4
Receptors (100 and 50 Meter Grid Extent)



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

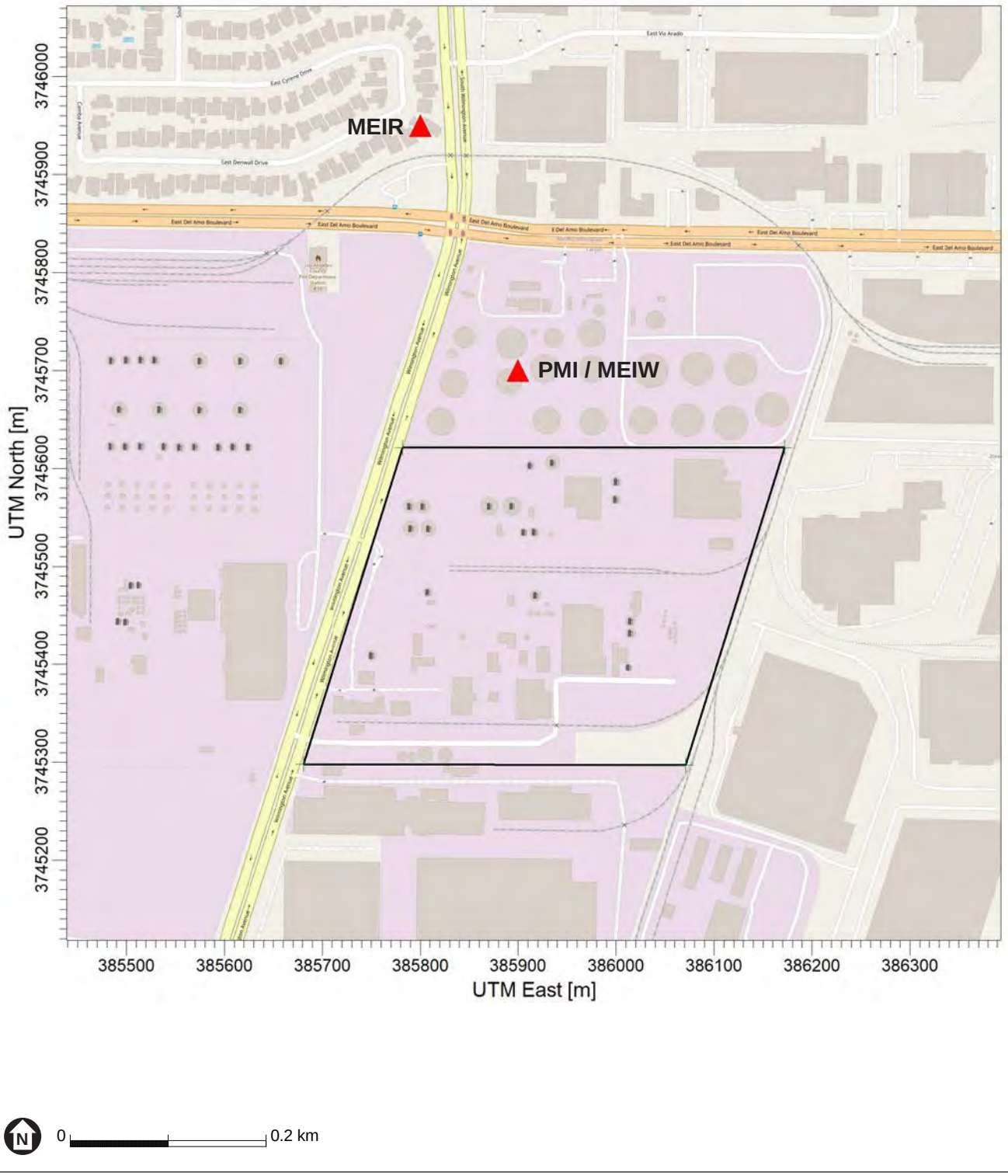
Figure 5
Receptors (20 Meter Grid Extent)



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

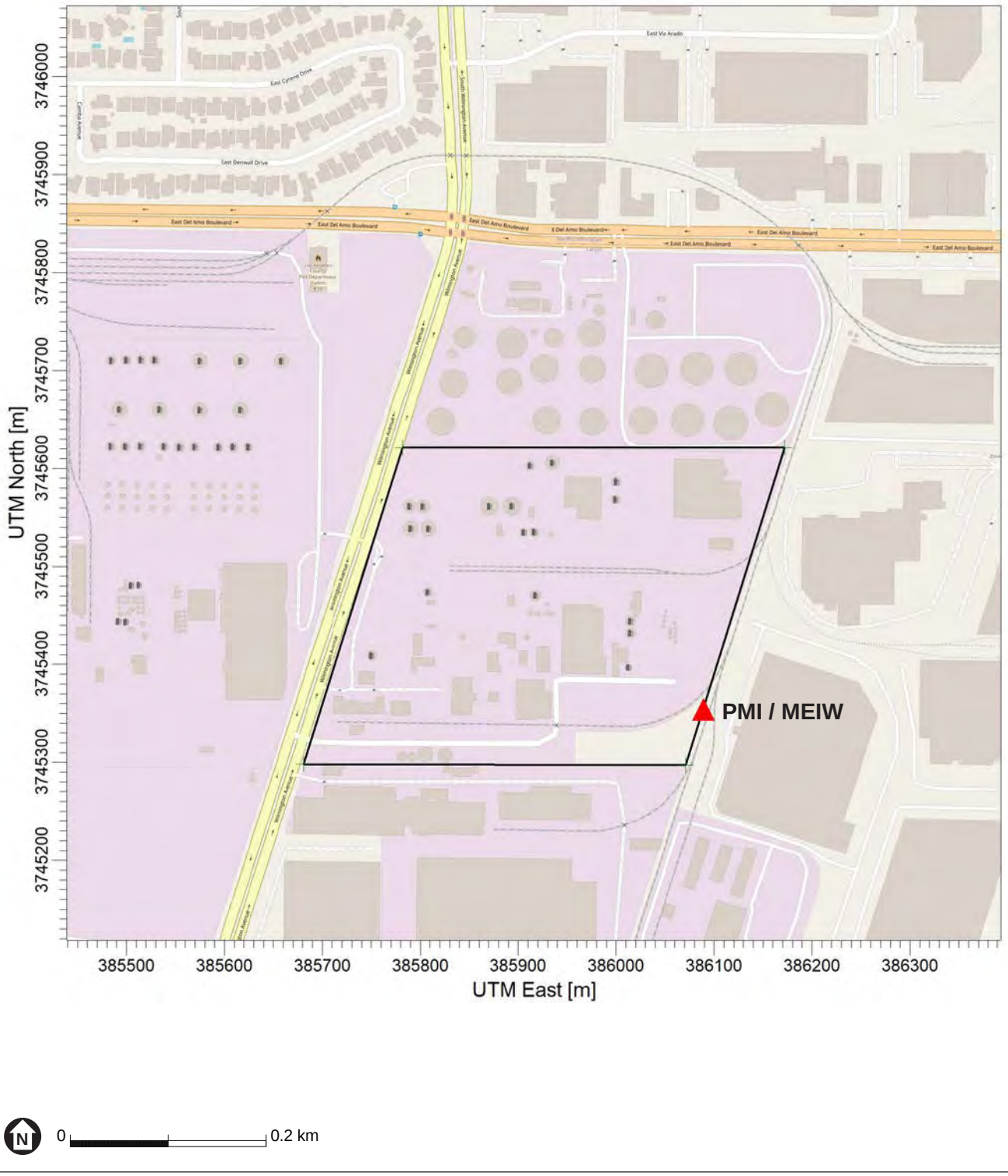
Figure 6
Locations of MEIR, MEIW and PMI for Cancer Risk



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

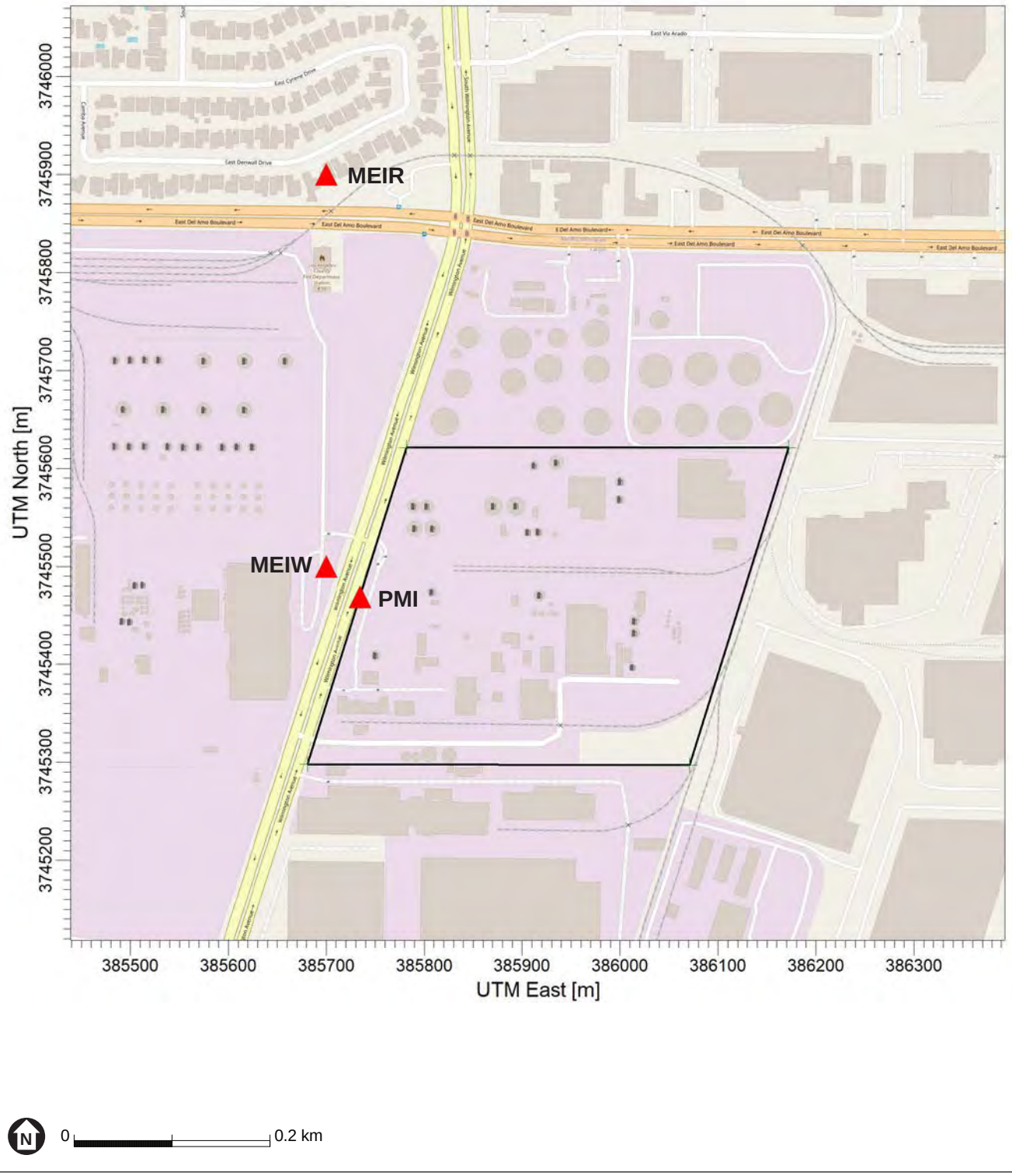
Figure 7
Locations of MEIR, MEIW and PMI for Chronic Hazard Index



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

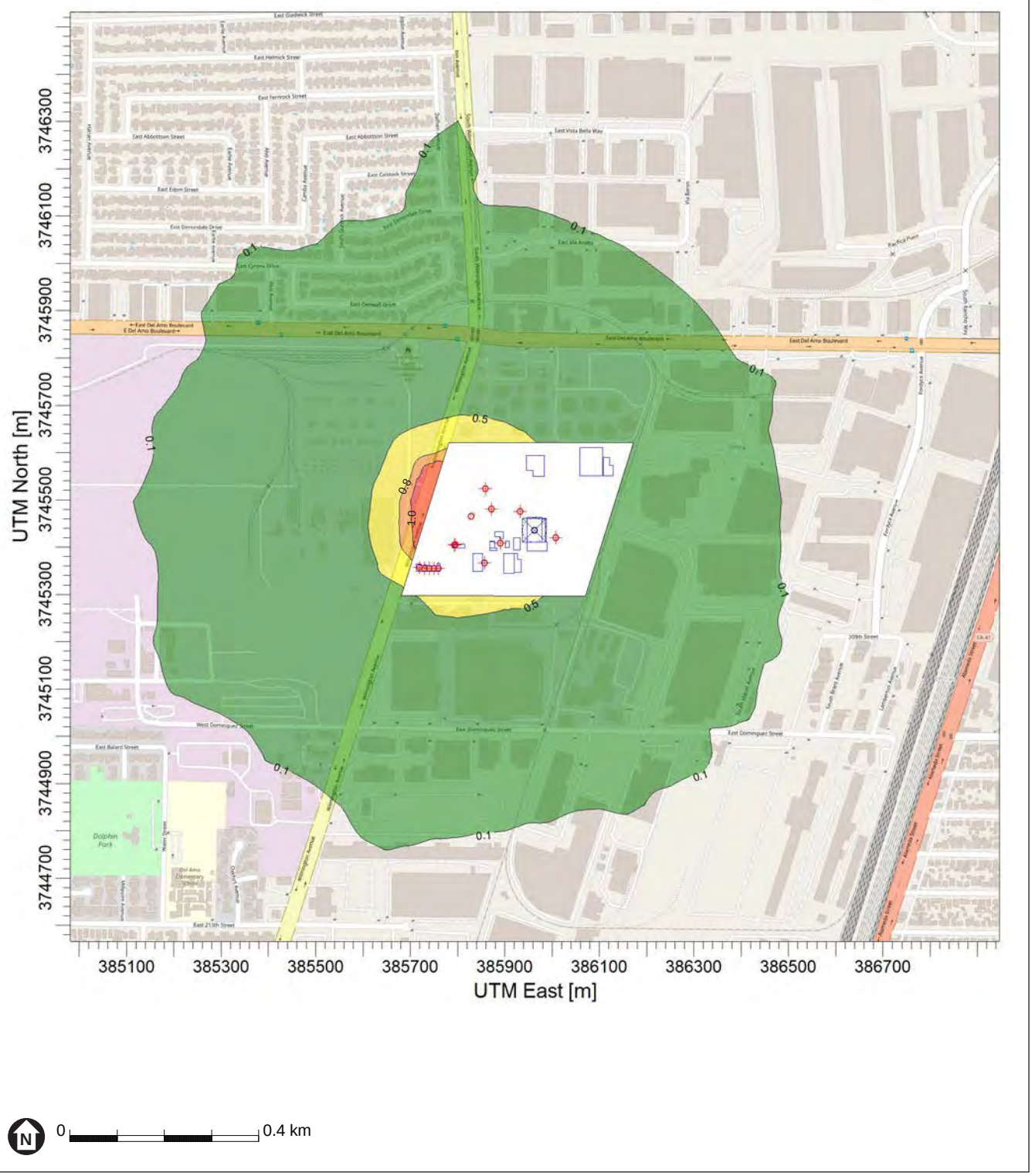
Figure 8
Locations of MEIW and PMI for 8-hr Chronic Hazard Index



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

Figure 9
Locations of MEIR, MEIW and PMI for Acute Hazard Index



SOURCE: Lakes Software Version 10.0.1

Ecoservices AB 2588 Health Risk Assessment

Figure 10
Acute Hazard Index Isopleths

Appendix C
2017 ATIR Emissions

ECO SERVICES DOMINGUEZ FACILITY - REVISIONS TO 2017 ATIR
(*October 22, 2021)*

Eco-Services' original ATIR was submitted to SCAQMD on May 6, 2020. This memo outlines changes made to the 2017 ATIR, as requested by Staff Engineer Pierre Sycip upon review of the ATIR (email communication dated July 14, 2021) and requested in a subsequent review (email communication dated October 19,2021). The follow paragraphs present the requested changes and the revised ATIR report tables are included as an addendum.

Sulfuric Acid Plant No. 4 (D1-D17 & C148) HCl Control Efficiency
ATIR Device 1, Process 2, Stack 1

HCl emissions for the Dominguez Sulfuric acid plant are calculated based on source test emissions from a similar EcoServices Plant. These emission calculations and source test data showed a control efficiency of 99.91% for HCl. SCAQMD staff has reviewed the source test data used as the basis for these calculations and requested that Ecoservices use an alternate lower control efficiency of 99% for the Eco Services Corporation Dominguez Facility Air Toxics Emission Inventory Report (ATIR) and HRA. There are no new pollutants from this device or process resulting from this emission factor change; simply an increase in the reported hourly and annual HCl emission rates. Process rates (tons of spent acid processed), hours of operation and uncontrolled emission factors (based on <0.01% Cl- in the waste acid) used to calculate the emissions remain unchanged. The emission factor is derived as follows:

Uncontrolled Emissions = 0.0001 lb HCl/lb waste acid*2000 lb/ton = 0.2 lb HCl/ton spent acid feedstock
Assume 99% HCl control efficiency
Controlled Emissions = 0.2*(1 -0.99)

HCl Emission Factor = 0.002 lb HCl/ton spent acid feedstock

Furnace (D1) Natural Gas Burner Combustion Emissions.
Device 1, Process 3, Stack 1.

The main acid furnace air toxic emissions quantified for annual air emission inventories and prior ATIRs have historically been limited to the emissions of acid gases (H2SO4 and HCl). The acid combustion in the furnace is assisted by two (2) 75 MMBtu/hour low NOx burners. The gas exhausting the combustion burners is treated by numerous exhaust gas processing devices (quench tower, gas cooling tower, gas drying tower) and multiple control devices including a dual stage electrostatic precipitator, acid absorption towers and a caustic wet scrubber before it is finally vented to the atmosphere (through the wet gas scrubber exhaust stack).

For completeness purposes, SCAQMD has requested inclusion of these auxiliary emissions in the ATIR. Since the control efficiency of the downstream control devices is difficult to estimate accurately and varies between different contaminants depending on solubility and volatility, Ecoservices has conservatively included these pollutants as uncontrolled emissions. Emissions factors are based on Natural Gas Combustion from External Combustion Boilers/Process Heaters rated between 10-100 MBTU/hr. This revision involves the addition of emissions from 10 TACs to the exhaust of Stack 1. Ammonia was not included in the emission factors because 1) there is no SCR or other control devices that utilize ammonia, and 2) any ammonia emissions generated during combustion would react with H2SO4 and be eliminated. Process rates for hourly emissions are based on the maximum heat input of two burners at 75 MMBtu/hr. Process rates for annual emissions are based on the annual natural gas consumed by the process which was determined by facility gas bills, subtracting the usage from the other permitted and exempt natural gas emission sources. The gas burners are assumed to operate the same hours as the acid plant combustion or 24 hours per day, 7 days per week, 50 weeks per year, allowing for plant maintenance and down time.

Device 14, Process 1. Soil Vapor Extraction System.

The 2017 ATIR contained emissions from perchloroethylene from a permitted soil vapor extraction system. The emissions included in the original ATIR (May 2021) were conservatively calculated for a single pollutant, perchloroethylene which is overwhelmingly the main contaminant of concern in terms of health risk. The

perchloroethylene emissions were based on a mass balance based on the 2017 recorded VOC quantity captured by the dual carbon adsorption system. This approach assumed all VOC captured was perchloroethylene and utilized a lower-end control efficiency in order to conservatively estimate (err on the high side) air emissions. Revised calculations include emissions from other trace contaminants included in the sampling report data, as per SCAQMD request. Since this calculation method speciates the VOC emissions, annual emission estimates were calculated using the analytical monthly reporting results for individual chemicals.

Hourly emissions estimates were calculated using the same methodology as before, based on the maximum detected sampling data (4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operations Corp Dominguez Plant, Carson, CA) and the SVE process exhaust flow rate. Annual emissions are calculated from the average reported concentration of pollutant in the effluent of the adsorber from monthly grab sample analytical results and the SVE design gas flow rate (250 cfm or 15,000 cubic feet per hour). In the majority of the monthly grab samples, emissions of the pollutants in the effluent of the carbon adsorber were listed as being non-detectable and below reporting limits. However, these same pollutants **were** detected at the inlet to the adsorber and could not be assumed to be absent. In cases where the pollutant was detected but concentrations were below the reporting limit, the pollutant concentration was conservatively assumed to be equal to the reporting value listed on the test result summary. This approach is overly conservative and overestimates impact of these trace pollutants; however, the reporting and detection limits of these trace compounds are quite low. Concentrations were tabulated from "Table 3 – Summary of SVE System Analytical Results" in the 4th Quarter SVE 2017 System report. A copy of this table is included here as a reference.

Design exhaust flow rate is 250 acfm or 15,000 ft3 per hour. The system operated January, February and August through December of 2017 for a total of 4704 hours.

Device 15, Process 1. Sulfur Handling/Unloading

The ATIR was also updated to include emissions of H2S that occur from the Sulfur Handling System. Emissions of H2S from the sulfur handling/unloading facility are minimal as the Sulfur received and utilized at Ecoservice is degassed and has very low levels of H2S. Calculations for H2S emissions are based on degassing to a level of 10 ppmw, an upper bound in terms of concentration and a well-documented industry standard for degassing levels. H2S emissions from the sulfur unloading system were calculated assuming that emissions occur during the displacement of the H2S in the vapor space above the molten sulfur based on the vapor concentration in equilibrium with the sulfur at 300 degrees F. Derivation of the H2S emission factor based on equilibrium of H2S and displacement of vapor via sulfur handling are included in the attachment. The vapor displacement volume is based on the density of molten sulfur and the maximum hourly and annual rates of sulfur handling/unloading at the facility. The maximum hourly sulfur rate is based on two trucks per hour (24 LTN per truck) and 2017 annual sulfur deliveries of 49,885 LTN per year

Table and Figure Addenda

Table 1: Source Location (Addendum)

Stack	Description	UTME	UTMN	Zone	Datum
15	Sulfur Unloading	385829	3745465	11	WGS 84

Sulfur handling system emissions are represented as an area source at Sulfur Pit, Permit ID D130.

Table 3: Emission Factors by Source (Addendum)

Source #	Permit ID	Process Description	CAS	TAC Name	Factor	Units	Emission Estimation Method
1	D1	Acid Plant Furnace	7647010	HCl	0.002	LB/TON SPENT ACID FEED	Source Testing Result (Measured) Engineering calculations Based on incineration data from process specific feedstock, SCAQMD Specified Control Efficiency
1	D1	Acid Plant – Natural Gas Low Nox Burners – 2 @ 75 MMBtu/hr	71432 50000 1151 91203 75050 100414 100543 108883 1330207	Benzene Formaldehyde Total PAHs (excluding Naphthalene) Naphthalene Acetaldehyde Ethyl Benzene Hexane Toluene Xylenes	0.0058 0.0123 0.0001 0.0003 0.0031 0.0069 0.0046 0.0265 0.0197	LB/MMSCF	AB2588 Reporting Guidance Appendix B, Table B-1 Default EF Boiler/Heater 10-100 MMBTU/Hr
14	D153 C152	Vapor Extraction Well And Adsorber	127184 79016 56235 67663 75014 75343 108883 71432 67630 75092 1330207 100414 71556 100425	Perchloroethylene Trichloroethylene Carbon tetrachloride Chloroform Vinyl chloride 1,1-dichloroethane Toluene Benzene Isopropyl alcohol Methylene chloride Xylenes (p/m/o) Ethylbenzene 1,1,1-trichloroethane Styrene	14,000 1,800 45 73 18 28 27 16 180 29 31 31 39 31	UG/M3 (Max Detected)	Mass balance using SVE Sampling data from 4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operation Corp Dominguez Plant, Carson, CA Hourly flow based on design flow of 250 acfm
14	D153 C152	Vapor Extraction Well And Adsorber	127184 79016 56235 67663 75014 75343 108883 71432 67630 75092 1330207 100414 71556 100425	Perchloroethylene Trichloroethylene Carbon tetrachloride Chloroform Vinyl chloride 1,1-dichloroethane Toluene Benzene Isopropyl alcohol Methylene chloride Xylenes (p/m/o) Ethylbenzene 1,1,1-trichloroethane Styrene	1,614 227 26 28 10 16 15 8 105 19 21 23 28 20	UG/M3 (Average of Sampling Data)	Mass Balance using SVE Sampling data from 4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operation Corp Dominguez Plant, Carson, CA Average includes non-detect in effluent based on Reporting Limits Hourly Flow based on design flow of 250 acfm And 4704 hours of operation in 2017
15	D130	Sulfur Pit	7783064	Hydrogen Sulfide	9.29E-3	LB/LTN SULFUR	Engineering Calculations based on Equilibrium and Mass Balance/Displacement of Vapor

Table 4: Operating Assumptions by Source (Addendum)

Source	Hrs/Day	Days/Wk	Wk/Yr	Comments
Acid Plant Furnace*	24	7	50	The acid plant is shut down 2 weeks per year for O& M
SVE System	24	7	28	The SVE system was in operation Jan - Feb and August -December of 2017
Sulfur Unloading	24	7	50	Sulfur Deliveries are unscheduled and can occur during day and night-time hours

*Hours for Acid Plant Furnace and SVE System remain unchanged. Information is provided here for informational purposes for the purpose of emission calculations.

Table 5: Fuel Use and Process Rate by Source (Addendum)

Device Number	Name	Permit ID	Eqt Size	Eqpt Units	Annual Process Rate	Maximum Hourly Process Rate	SCC Units
1*	Acid Plant No. 4	D1-D17/C148			280,052	41.667	Tons of spent acid feedstock
1	Acid Plant No. 4 Low NOx Burners	D1-D17/C148	2 @ 75	MMBTU/hr	636.9	0.1428	MMSCF Natural Gas Burned
14	SVE System	D153/C152			70,560,000	15,000	STANDARD CUBIC FEET
15	Sulfur Pit	D130			49,885	48	Long Ton (LTN)

(*) Acid Plant Feedstocks rates remain unchanged. Information provided with addendum for calculational purposes only.

Table 6: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	**Permit ID**	**Process Description**	**Pollutant**	**Maximum Hourly Lbs/hr**	**Annual Average Lbs/yr**
1, Process 2	D1-D17/C148	Acid Plant No. 4	HCl	0.08333334	560.104
1, Process 3	D1-D17/C148	Acid Plant Furnace Natural Gas Burners - Natural Gas Combustion	Benzene	0.0008282	3.69402
			Formaldehyde	0.0017958	7.83387
			Total PAHs (excluding Naphthalene)	1.43E-05	0.06369
			Naphthalene	4.28E-05	0.19107
			Acetaldehyde	0.0004427	1.97439
			Ethyl Benzene	0.0009853	4.39461
			Hexane	0.0006569	2.92974
			Toluene	0.0037842	16.87785
			Xylenes	0.0028132	12.54693
14	D153/ C152	SVE System	Perchloroethylene	0.01311	7.112448
			Trichloroethylene	0.00169	0.99913
			Carbon tetrachloride	4.21E-05	0.115225
			Chloroform	6.84E-05	0.124115
			Vinyl chloride	1.69E-05	0.042809
			1,1-dichloroethane	2.62E-05	0.072536
			Toluene	2.53E-05	0.064774
			Benzene	1.50E-05	0.036021
			Isopropyl alcohol	0.000169	0.464003
			Methylene chloride	2.72E-05	0.084672
			Xylenes (p/m/o)	2.90E-05	0.092998
			Ethylbenzene	2.90E-05	0.101324
			1,1,1-trichloroethane	3.65E-05	0.124821
			Styrene	2.90E-05	0.089893
15	D130	Sulfur Unloading	Hydrogen Sulfide	0.44544	462.9328

Emission Factor - Equilibrium Calculations for Sulfur Unloading

Sulfur is degassed to Industry Standard of <= 10 ppmw H2S			
Melting Point of Sulfur	235	F	694.67 R
Temperature of Molten Sulfur	**300**	**F**	**759.67 R**
Density of Sulfur at Melting Point	1.819	g/cm3	
	113.506	lb/ft3	
Molecular weight of H2S	34.1	lb/lb-mole	

Reference: **Table 3: Equilibrium Vapor Space H2S Concentration above S with no purge**

ppmw total H2S in loaded sulfur	Equilibrium temperature (F)	vol% H2S in vapor space
10	300	0.7

From: Hazards of Molten Sulfur Storage and Handling, Proceedings of the 53rd Annual Laurance Reid Gas Conditioning Conference, Feb 23-26, 2003.
Johnny B. Johnson and Nathan Hatcher.

Calculate the density of H2S in equilibrium in vapor space using volume percent and ideal gas law.

0.007 PV = n RT

n/V= 0.007 P/RT

$$\frac{m}{V}\ (lb/ft^3) = \frac{0.007\ P\ *\ MW(H2S)}{R\ T}$$

$$\text{density H2S } (lb/ft^3) = \frac{0.007 * 1\ atm * 34.1\ lb/lb\text{-}mole}{0.7302413\ ft^3\ atm/(R\text{-}lb\text{-}mole) * (759.67\ R)}$$

density = 0.00047 lb/ft3

EMISSION FACTOR - TRANSFER/DISPLACEMENT OF VAPOR FROM SULFUR UNLOADING

BASIS: 1 LTN (LONG TON) SULFUR TRANSFERRED

2,240	LB S - TRANSFERRED
2,240	LB S/113.50 LB/FT3
19.73	FT3 DISPLACED PER LTN
19.73	FT3*0.00047 LB H2S/FT3
9.28E-03	LB H2S EMITTED/LTN SULFUR UNLOADED

WEIGHT OF DELIVERIES PER YEAR (LTN)	NUMBER OF DELIVERIES PER YER	SULFUR PER DELIVERY (LTN)	AVG DAILY DELIVERIES	MAX HOURLY DELIVERIES
49,885	2251	22.2	6.4	2

SULFUR DELIVERIES	S THROUGHPUT (LTN)	H2S EMISSIONS (LB)	UNITS
ANNUAL	49885	463	LB/YR
DAILY	142.5	1.32	LB/DAY
DELIVERY	22.2	0.21	LB/DELIVERY
HOUR	48	0.45	LB/HR

AIR TOXICS "HOT SPOTS" INFORMATION AND ASSESSMENT ACT (AB2588)
AIR TOXICS INVENTORY REPORT

FOR

ECO SERVICES OPERATIONS CORP.
20720 S. WILMINGTON AVENUE
CARSON, CALIFORNIA

(FACILITY ID #180908)

Submitted to:
South Coast Air Quality Management District

Prepared by:
Pika Environmental, LLC
4065 Woodman Canyon
Sherman Oaks, CA

May 2020

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1.0 BACKGROUND AND PURPOSE

1.1 Background

The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB2588) established a statewide program for the inventory of air toxics emissions from individual facilities as well as requirements for risk assessment and public notification of public health risk. The elements of AB2588 are contained in the California Health and Safety Code (Section 44300, et al.) and the California Code of Regulations (Section 93300, et al). Section 44360(a) requires the South Coast Air Quality Management District to prioritize facilities based on the submitted emission inventories and then place them into one of three categories: high, intermediate, and low priority. Facilities designated as high priority are required to submit Health Risk Assessments to assess the risk to their surrounding community. Facilities ranked with an intermediate priority are considered "District Tracking" facilities, which are then required to submit a complete toxics inventory once every four years. Facilities ranked as low priority are exempt from reporting.

Eco Services Operations Corp (Eco Services) has completed "quadrennial" emissions inventories since the beginning of the AB2588 program. In 2006, at SCAQMD's request, a Health Risk Assessment (HRA) was conducted based on the facility's Fiscal Year 2001-2002 emissions. The submitted HRA utilized the State of California Air Resources (CARB's) "Hot Spots" Analysis and Reporting Program (HARP) which streamlines emission inventories and risk assessment requirements into a single integrated analysis tool. The results of the previous HRA indicated that cancer risk to the maximum exposed individual worker and resident were well below the significance threshold of 10 in a million. In addition, the maximum potential acute and chronic health impacts were below the Hazard Index of 1, a threshold requiring public notification.

1.2 Purpose

In December of 2019, Eco Services was notified by the SCAQMD that it is required to submit either an Air Toxics Inventory Report (ATIR) or a Voluntary Risk Reduction Program, because it was given a priority score of greater than 1, based on their most recent AB2588 quadrennial emissions report from 2017. Since the facility has identified few additional opportunities to further reduce risk, it has elected to submit an ATIR. This ATIR incorporates the March 2015 changes to OEHHA's Health Risk Assessment Guidelines for estimating health risk, as well as changes to District Rule 1402.

The ATIR is organized in the outline format specified in Appendix A of the SCAQMD's AB2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidance for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act).

Section 2 of the report presents basic facility information, including facility name general location, products produced and surrounding land use. Section 3 provides process descriptions by process line. Section 4 presents a description of the facility layout, the source types and functions within the facility, source locations by UTMs, and Toxic Air Contaminants (TACs) associated with each source. Section 5 provides source characterization data, including emission factors employed, whether the factor was estimated or measured, as well as annual average and worst hour emissions. The Appendix provides supporting documentation such as source tests, and agency approval letters for source test protocols, and other information used to determine air toxic sources and develop emissions.

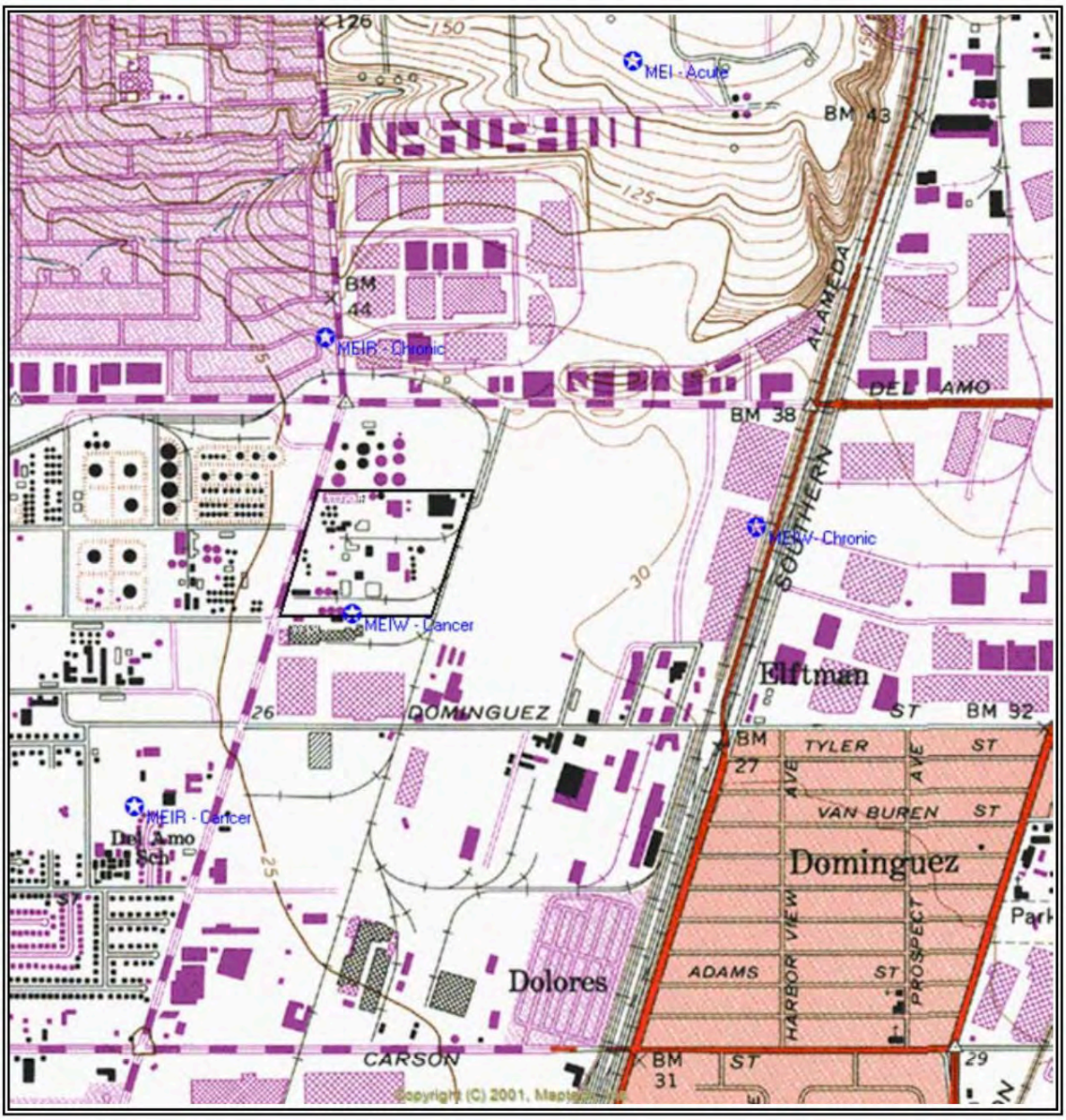
In addition to the written portion of the ATIR, the Eco Services submittal includes a file, submitted through the SCAQMD Drop Box site, containing the EIM portion of HARP populated with the facility, device, process emissions and stack data required under the guidelines.

2.0 FACILITY INFORMATION

The Eco Services Dominguez facility (SCAQMD Facility ID 180908) is located at 20720 Wilmington Avenue, Carson, CA. The facility is within the jurisdiction of the City of Carson and is surrounded by industrial land use in all directions. The topography of the area is relatively flat as the facility is situated in the coastal plain, approximately 6 miles from the Pacific Ocean. The land use in the area is considered urban. Figure 1 shows the location of the Eco Services facility and its property line relative to the surrounding area, including Wilmington Avenue (on the western boundary of the facility) and the San Diego Freeway to the west and south of the facility.

The land use surrounding the facility is heavily industrial. Several refineries and chemical plants abut the facility. The land to the east of the facility includes warehousing operations. Nearby residential neighborhoods are located to the west of Wilmington Avenue: the nearest resident is immediately north of Del Amo Boulevard. The nearest elementary school is Del Amo Elementary, situated near the intersection of 213th and Water Streets.

Figure 1: SITE PLAN AND LOCATION OF MAXIMUM IMPACTS



3.0 PROCESS DESCRIPTION BY PRODUCT LINE

Eco Services produces two main product lines in their Dominguez facility: sulfuric acid and aluminum sulfate. Sulfuric acid is the largest volume chemical manufactured in the United States and is used in many industries. The largest volume sulfuric acid customers for the Dominguez Plant are refineries who use sulfuric acid as a catalyst in their alkylation process. The aluminum sulfate solution is used primarily in the water treatment and paper manufacturing industries.

3.1 Sulfuric Acid Production

Sulfuric acid at this site is manufactured in a regeneration sulfuric acid process. Regeneration means that spent sulfuric acid is converted back into fresh sulfuric acid. The strengths of sulfuric acid produced at this site range from 93 to 99%.

Spent sulfuric acid from refinery alkylation and elemental sulfur are burned in a natural gas fired furnace. The combustion products, including approximately 10% sulfur dioxide, pass through a waste heat recovery boiler that generates all the steam needed at the site. The main steam user is the turbine driving the main gas blower for the process. Surplus steam is diverted to an on-site electrical co-generation unit.

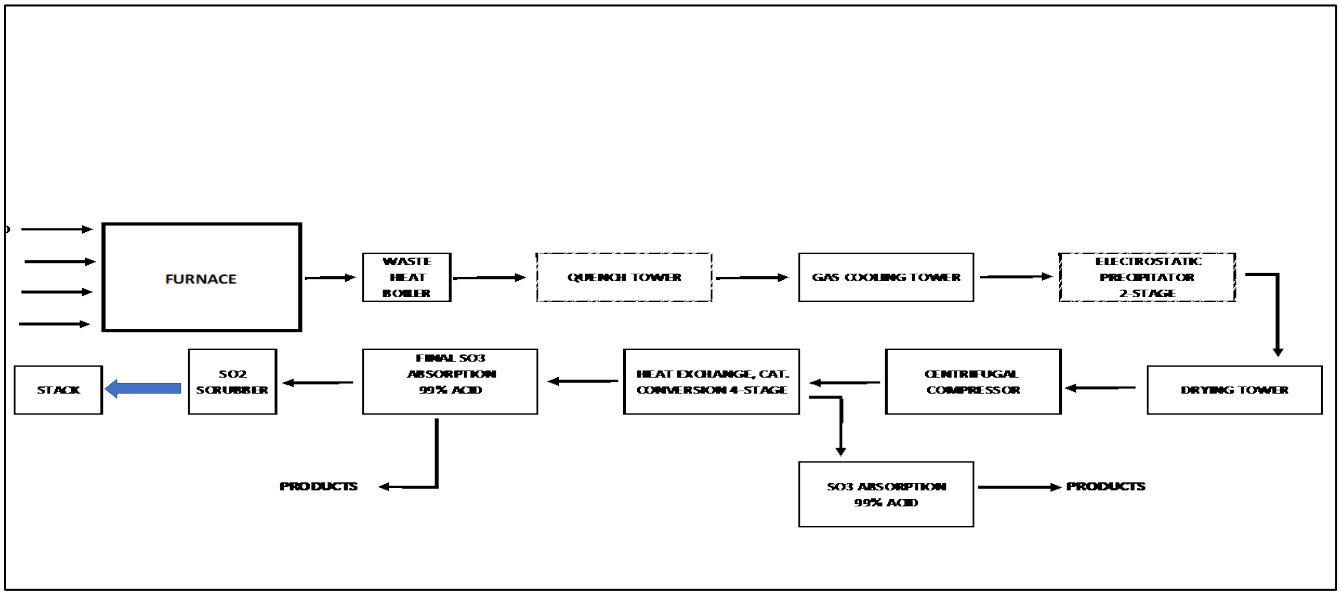
Process gas exiting the waste heat boiler is further cooled and cleaned in a quench tower, gas cooling tower, and a dual stage electrostatic precipitator. The gas is then dehumidified in a strong acid-drying tower before the gas passes through the steam turbine driven main gas blower. The sulfur dioxide gas is then catalytically oxidized to sulfur trioxide in four-stage converter/heat exchanger set. The intermediate and final strong acid absorption towers trap the sulfur trioxide and produce 99% sulfuric acid solution.

The tail gas leaving the final absorption tower typically contains about 200 ppm sulfuric dioxide that is further reduced to 5 ppm in a 2-stage caustic scrubber. The sulfur dioxide reacts with the caustic solution to form sodium salts. The sodium salt solution is acidulated

to form sodium sulfate, stripped to remove sulfur dioxide, and discharged to the wastewater treatment system for disposal. The remaining gas, consisting of nitrogen, oxygen, carbon dioxide and small quantities of sulfur dioxide and nitrogen oxides, is vented to the atmosphere through a wet gas scrubber exhaust stack.

Figure 2 shows a block flow diagram of the sulfuric acid plant in which the demisters are labeled.

Figure 2: Sulfuric Acid Plant Block Flow Diagram



3.2 Aluminum Sulfate Production

Aluminum sulfate solution is made in a batch process by blending fine aluminum trihydrate powder, sulfuric acid, and water in a heated and agitated reactor for several hours. The batch settles overnight and the finished product is decanted off the top of the reactor and pumped to storage. Filtration is provided for the material in the finished product storage tank and for the loading area. Byproduct aluminum sulfate solution is also received from other companies. The process normally operates during day shift only but on occasion will operate two shifts per day during a peak demand period.

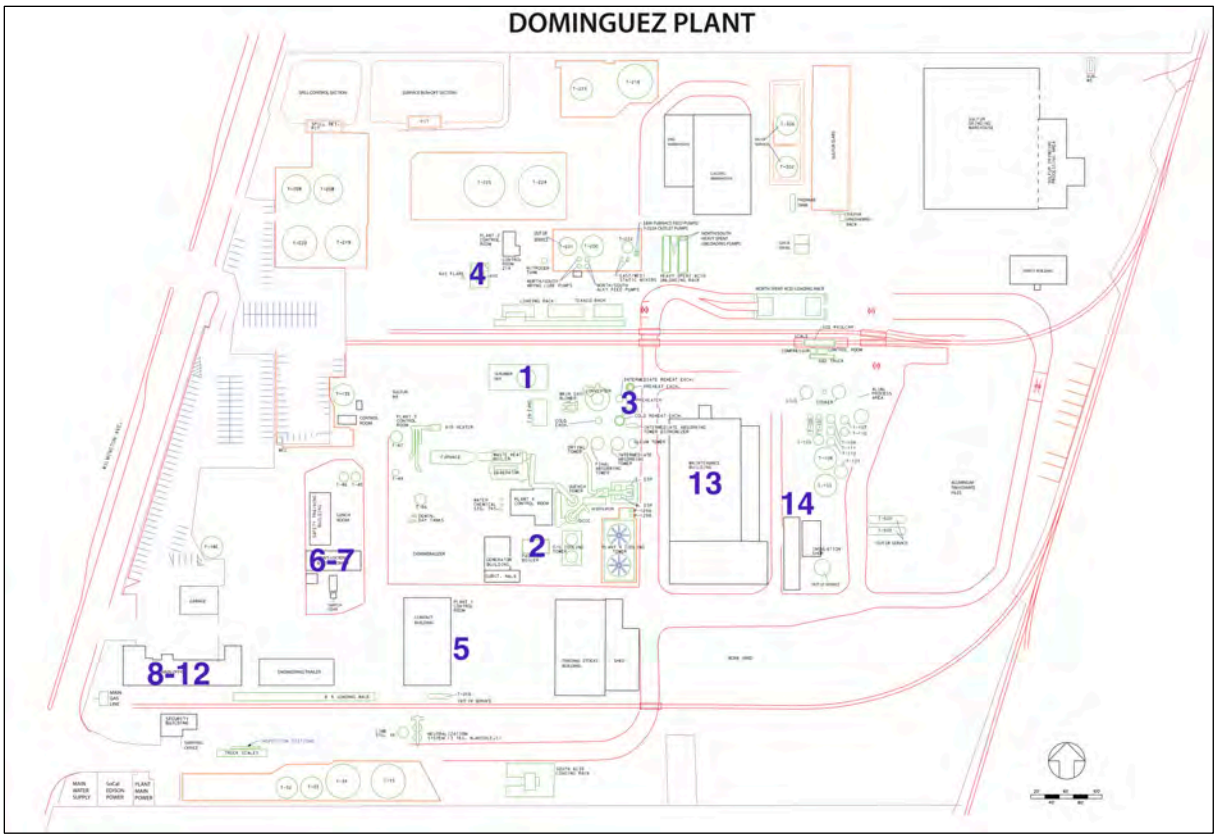
4.0 SOURCE CHARACTERIZATION

Section 4 provides general information on the Eco Services facility layout and detailed descriptions of the sources that have the potential to produce air toxics at the site. This section also describes sources present on the site without the potential to produce toxics, along with the rationale for why these sources were excluded from the ATIR inputs.

4.1 Facility Layout

Figure 3 shows a more detailed plot plan of the facility. The northern portion of the site is used for raw material storage and warehousing and loading racks for sulfuric acid. At the eastern boundary is situated the aluminum production line. Just west of center of the site is the sulfuric acid production line. Various buildings for employees are present in the southwest corner of the site, including the main office, shipping, security, the engineering trailer, the maintenance building and the men's locker room. Most of the western portion of the site is reserved for parking.

Figure 3: Eco Services Plot Plan



4.2 Source Types and Locations

Figure 3 also shows the distribution of sources throughout the site. The types of air toxic emission sources and their respective permit IDs (where applicable) are as follows:

Source 1: Acid Plant (D1-17)
Source 2: Package Boiler (D139)
Source 3: Startup Heater/Preheater (D98)
Source 4: AVS Flare (C126)
Source 5: Diesel Air Compressor (former D100)
Source 6 &7: Water Heater and Comfort Heater in the Men's Changing Room (Rule 219 Exempt)
Source 8 through 12: HVAC Units in the Main Office Building (Rule 2019 Exempt)
Source 13: Maintenance Building Space Heaters (Rule 219 Exempt)
Source 14: SVE Extraction Treatment System (permitted by DTSC)

Other air emission sources that produce criteria pollutants but not air toxics include the cooling tower (D16) and the aluminum trihydrate unloading system (D37-D44). As described in the following paragraphs, the gasoline tank was removed from the site in 2014 and its emissions will be excluded from the ATIR.

Table 1 provides a list of the sources and their UTM locations. Building locations and dimensions were also developed for input purposes. These source location and building downwash data have been loaded into the HARP EIM portion of the ATIR.

Table 1: Source Locations

Stack		UTME	UTMN	Zone	
1	Sulfuric Acid Plant	385872	3745481	U11	WGS84
2	Package Boiler	385891	3745408	U11	WGS84
3	Process Heater	385932	3745476	U11	WGS84
4	AVS Flare	385859	3745524	U11	WGS84
5	Diesel Air Compressor	385857	3745367	U11	WGS84
6	Change Room - Heater	385793	3745402	U11	WGS84
7	Change Room - Water Heater	385795	3745405	U11	WGS85
8	Office - Heater 1 Stack	385720	3745355	U11	WGS86
9	Office - Heater 2 Stack	385730	3745355	U11	WGS87
10	Office - Heater 3 Stack	385740	3745355	U11	WGS88
11	Office - Heater 4 Stack	385750	3745355	U11	WGS89
12	Office - Heater 5 Stack	385760	3745355	U11	WGS90
13	Maintenance Bldg Ridge Vent	385963	3745436	U11	WGS91
14	SVE	386008	3745420	U11	WGS92

4.3 Source-Specific Descriptions:

Each source listed above is described below in terms of their types of TAC emissions and hours of operation.

Sulfuric Acid Plant

Emissions of interest from the sulfuric acid process include sulfur dioxide, nitrogen oxides, and aerosol sulfuric acid mist. Information on each is discussed below.

Sulfur dioxide emissions are well controlled with the double absorption system and the tail gas caustic scrubber. Sulfur dioxide emissions are regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfur dioxide emissions are limited to 4 pounds of sulfur dioxide per ton of sulfuric acid produced. A tighter limit is in the site's Title V facility permit as a result of a Consent Decree with the EPA that further limits sulfur dioxide emissions to 3.5 lbs of sulfur dioxide per ton of sulfuric acid produced. Sulfur dioxide emissions are actually much lower than this limit. The caustic scrubber, installed to comply with reduced sulfur dioxide allowances under RECLAIM, has enabled the site to reach very low sulfur dioxide emissions.

Nitrogen oxide emissions from sulfuric acid plants are not regulated under any federal regulations. The site complies with RECLAIM allowances using low NOx burners on the furnace and maintaining an adequate allocation.

Aerosol sulfuric acid mist emissions are considered particulates and regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfuric acid mist emissions are limited to 0.15 pounds of sulfuric acid mist per ton of sulfuric acid produced. Actual emissions are in the range of 0.018 lbs of sulfuric acid mist/ton of acid produced. Aerosol sulfuric acid mist generated in the process is controlled by glass fiber demisters installed in the upper section of the strong acid absorption towers.

Testing for sulfuric acid mist is performed once per year using EPA Test Method 8. Table 2 provided below summarizes the results of this testing over the last 5 years.

Table 2: Measured Sulfuric Acid Mist Levels

Date	Sulfuric Acid Mist #/Ton of H_2SO_4 Produced*	Sulfuric Acid Mist Standard
7/30/2019	0.016	0.15
8/1/2018	0.022	
8/8/2017	0.018	
8/2/2016	0.017	
2/4/2015	0.016	

*Based on annual source test data

These results show that aerosol sulfuric acid mist emissions are consistently far below the allowable regulatory standard. The 2017 source test report that serves as the basis for the sulfuric acid emission factor is provided in Appendix A of this report.

There are chloride contaminants in the spent sulfur acid feedstock at the Dominguez plant, like that present in spent acid feedstocks in Eco Services' Houston and Baton Rouge plants. The Houston and Baton Rouge plants, facilities with identical process equipment to Dominguez, have conducted trial burns to determine HCl removal efficiency of test wastes. The feedstock utilized in one of the trial burns closely resembles the typical chloride content experienced at the Dominguez facility and was used to determine HCl removal efficiency and estimate residual HCl emissions. The trial burn data that forms the basis of this estimate, as well as the emission calculations, are provided in Appendix B of the ATIR. Aerosols of hydrochloride emissions are estimated at 0.00018 lbs/ton of spent acid feedstock.

Package Boiler

The package boiler has a permitted capacity of 49 million BTUs per hour. This boiler generates high-pressure superheated steam. This boiler is operated only when the sulfuric acid process is down or in the start-up mode since the sulfuric acid process generates all necessary steam when operating. This boiler uses a low NOx burner to keep NOx emissions below the permit limit of 36.855 ppm.

Start-up Heater

The start-up heater system has a rated capacity of 50 million BTUs per hour. The system consists of a preheat furnace and a preheat exchanger. The start-up heater system is used when the sulfuric acid process is in the startup mode when additional heating of the catalyst in the converter is needed. The normal converter operating temperature is 800 ˚F and above. This equipment is used to start-up after turnarounds and after any shutdown when additional catalyst and converter heating is needed.

The combustion system for the furnace exhausts through the shell side of the preheat exchanger to the atmosphere. Process gas from the discharge of the main gas blower is directed through the tube side of the preheat exchanger and then into the converter. Once the catalyst/converter is adequately heated, the start-up heater system is shut down and bypassed.

Flare

The site has a flare with a pilot and gas assist with a rated capacity of 1.09 million BTUs per hour. The flare combusts exhaust from a caustic scrubber system treating vent gas, containing sulfur dioxide and potential VOCs, from truck and railcar unloading/loading facilities handling spent sulfuric acid. The caustic scrubber/flare system is also a backup

vent system for spent sulfuric acid storage tanks that normally vent to the sulfuric acid plant regeneration furnace.

Diesel Air Compressor

The diesel internal combustion engine drives a compressor utilized in the case of power outage to maintain safe pressure conditions in the acid plant. Normally, it is operated only for weekly testing; about 90 minutes per year. The use of this engine was terminated in 2017 but since it was tested that year, the testing emissions have been included in the ATIR.

Men's Changing Room Heaters

The men's changing room has both a natural gas water heater and a comfort unit. The water heater has a rated heat input of 76,000 BTUs/hr. and the comfort heating system is rated at 90,000 BTU/hr.

Maintenance Building Space Heaters

Ten natural gas-fired heaters are used in the maintenance building for workstation heating. The exhaust from these heaters are directed to a common location and discharged through a ridge vent that runs the length of the building along the roof centerline. One heater has a rated heat input of 30,000 BTUs/hr.; five are rated at 50,000 BTUs/hr. and four are rated at 100,000 BTUs/hr.

Main Office Building Heaters

The main office has 5 HVAC units fired by natural gas. Four of the units are rated at 100,000 BTU's/hr. and the other is rated at 90,000 BTUs/hr.

SVE Removal System

In the 1970's and 1980's, the facility transferred perchloroethylene (PCE) from railcars to storage tanks to trucks. A Soil Vapor Extraction (SVE) system was installed following closure of the storage tanks to remove PCE from the underlying soils. The system included an extraction well system, a blower, heat exchanger, water knock out tanks, and two carbon adsorption units arranged in series. The installation was conducted in accordance with an administrative agreement under the direction of the California Department of Toxic Substances Control (DTSC). The system became operational in the fourth quarter of 2016 and has continued to operate until recently. The facility is currently negotiating with DTSC to convert to a passive SVE system since the PCE removal rate have become asymptotic. When those negotiations are complete, Eco Services will update its Title V permit accordingly as also communicated and discussed with the permit engineer at SCAQMD. Since the system was in operation in 2017, emissions from the system are included in the ATIR. Monthly monitoring data, required as a condition under the SVE air permit, is used as the basis for the emissions estimate for this source and a summary of that information, used to develop SVE emissions estimates, is provided in Appendix D of this report.

4.4 Other Sources Not Included in the Air Toxics Inventory

Other sources at the facility that emit criteria pollutants are described below, along with the rationale behind why they were excluded from the air toxics inventory.

Gasoline Fueling

Historically, gasoline-dispensing units were employed to fuel company vehicles. In 2013, a financial analysis was conducted that showed it was more cost-effective to fuel company vehicles offsite. As a result, this tank was taken out of service in 2014 and its permit removed from the Title V permit. Documentation of their removal is contained in Appendix C of this report.

Cooling Towers

The Eco Services Dominguez facility has two cooling towers – the Plant 4 Cooling Tower (D16 in the permit) and the Turbo-generator Cooling Tower (E133 in the permit). The Plant 4 Cooling Tower supplies cooling water to various equipment in the sulfuric acid process,including week acid coolers, strong acid coolers the main gas blower turbine steam condenser, the main gas blower lube oil cooler, and air plant air compressors. The Turbo-generator Cooling Tower supplies cooling water to equipment in the Turbo-generator system, including, the air turbo-generator steam condenser, generator air coolers and generator system lube coolers.

Chromium-containing corrosion inhibitors have never been used in either cooling tower. In addition, since the Dominguez Plant processes inorganic chemicals, no VOCs are produced. Therefore, there are no air toxics associated with this source and its emissions are not included in the ATIR.

Aluminum Sulfate Plant

Emissions from the aluminum sulfate plant consist of a small quantity of aluminum trihydrate particulates released from a filter vent in the pneumatic unloading system. Since no toxics are contained in the particulate, this source was also excluded from the ATIR.

5.0 EMISSIONS CHARACTERIZATION

Section 5 provides a summary of emissions data utilized for the air toxics sources described in the previous section of the ATIR. Included in this section are:

- A listing of emission factors with the names of Toxic Air Contaminants and CAS numbers applicable to each source identified;
- Information on whether emissions are measured or estimated and references for each emission factor; and
- Calculation input data in terms of fuel usage, hours of operation or throughput (depending upon the emission factor employed).

Following these data, summary charts of emissions by source are provided for both annual average hourly emissions and maximum 1-hour emissions.

5.1 Emission Factors by Source

Table 3 presents emission factors by source type. Most of the emission factors utilized are from the AB2588 Reporting Guidance, Appendix A. The acid plant emission factors were derived from source test data (sulfuric acid) and feedstock specific engineering calculations (HCl). The SVE factor was developed from DTSC monitoring report data.

Table 3 - Emission Factors by Source

Source #	Permit ID	Process Description	CAS	TAC Name	Factor	Units	Emission Estimation Method
1	D1	Acid Plant Furnace	7664939	Sulfuric Acid	0.018	LB/TON OF H2SO4	Source Testing Result (Measured)
			7647010	Hydrochloric Acid	0.00018	LB/TON OF SPENT ACID FEED	Engineering Calculations Based on Trial Burn Data from Process-Specific Feedstock
2 & 3	D139	Package Boiler	71432	Benzene	0.0058	LB/MMSCF	AB2588 Reporting Guidance
	D98	Start-up Heater	50000	Formaldehyde	0.0123		Appendix B, Table B-1 Default EF
			1151	Total PAHs (excluding Naphthalene)	0.0001		for Natural Gas Combustion, Source: Boiler/Heater 10-100 MMBTU/Hr
			91203	Napthalene	0.0003		
			75070	Acetaldehyde	0.0031		
			107028	Acrolein	0.0027		
			7664417	Ammonia	3.2000		
			100414	Ethyl Benzene	0.0069		
			100543	Hexane	0.0046		
			108883	Toluene	0.0265		
			1330207	Xylenes	0.0197		
4	C126	Non-Refinery Flare	71432	Benzene	0.159	LB/MMSCF	AB2588 Reporting Guidance
			50000	Formaldehyde	1.169		Appendix B, Table B-1 Default EF
			1151	Total PAHs (excluding Naphthalene)	0.003		for Natural Gas Combustion, Source: Flare, Non-Refinery
			91203	Napthalene	0.011		
			75070	Acetaldehyde	0.043		
			107028	Acrolein	0.010		
			100414	Ethyl Benzene	1.444		
			100543	Hexane	0.029		
			108883	Toluene	0.058		
			1330207	Xylene	0.029		
5	D100	Diesel Air Compressor	71432	Benzene	0.1863	LB/1000 GAL	AB2588 Reporting Guidance
			106990	1,3-Butadiene	0.2174		Appendix B, Table B-2: Default EF
			7440439	Cadmium	0.0015		for Diesel/Distillate Fuel Combusion,
			50000	Formaldehyde	1.7261		Source: Stationary ICE
			18540299	Hexavalent Chromium	0.0001		
			7440382	Arsenic	0.0016		
			7439921	Lead	0.0083		
			7440020	Nickel	0.0039		
			1151	PAHs (excluding Napthalene)	0.0362		
			91203	Napthalene	0.0197		
			75070	Acetaldehyde	0.7833		
			107028	Acrolein	0.0339		
			77664417	Ammonia	0.8000		
			7440508	Copper	0.0041		
			100414	Ethyl Benzene	0.0109		
			110543	Hexane	0.0269		
			7647010	Hydrogen Chloride	0.1863		
			7439965	Manganese	0.0031		
			7439976	Mercury	0.0020		
			7782492	Selenium	0.0022		
			108883	Toluene	0.1054		
			1330207	Xylenes	0.0424		
			9901	Diesel Exhaust Particulates	33.5000		
6 thru 13	Exempt	Maintenance Building - Heaters	71432	Benzene	0.0080	LB/MMSCF	AB2588 Reporting Guidance
			50000	Formaldehyde	0.0170		Appendix B, Table B-1 Default EF
	Exempt	Water/Comfort Heaters - Men's Changing Room	1151	Total PAHs (excluding Naphthalene)	0.0001		for Natural Gas Combustion, Source: Heater <10 MMBTU/Hr
	Exempt	Main Office HVAC Units	91203	Napthalene	0.0003		
			75050	Acetaldehyde	0.0043		
			107028	Acrolein	0.0027		
			7664417	Ammonia	3.2000		
			100414	Ethyl Benzene	0.0095		
			100543	Hexane	0.0063		
			108883	Toluene	0.0366		
			1330207	Xylenes	0.0272		
14	DTSC Permit	SVE System	127814	Percholorethylene	9.24E-07	LB/SCF	Acute emission factor calculated from highest 2017 monitoring result*

* Annual emissions for chronic exposure were calculated from a material balance

5.2 Operating Assumptions by Source

Table 4 summarizes assumptions for daily, weekly and yearly operation by source. The acid plant is in operation 24 hours per day, 7 days per week, except during yearly maintenance operations (about two weeks per year on average). The non-refinery flare associated with the produced and spent acid loading and unloading also runs continuously. Both the package boiler and start-up heaters provide supplemental heat to the acid plant when necessary. The package boiler operated 240 hours in 2017.

In addition to supplemental heat, the start-up heater is utilized to bring the acid plant up to full capacity after turnarounds. It operated 175 hours in 2017, typically at 50% of rated capacity.

TABLE 4: Operating Assumptions By Source

Source	Hour/Day	Days/week	Weeks/Year	Comments
Acid Plant Furnace	24	7	50	The Acid Plant is shutdown two weeks per year for O&M
AVS Flare	24	7	52	The flare operates continuously
Package Boiler	24	1	10	Operated at 50% of design capacity for 240 hours
Start-Up Heater	15	1	8	Operated intermittently; 120 hours/year in 2017
Space Heaters	8	7	26	Utilized November through April on day shift only
Water Heater	24	7	52	Operates all months of the year
Diesel Air Compressor	2	1	1	ICE operates 2 hours/year for emergency testing
SVE System	24	7	28	The SVE system was in operation from January through February and August through December of 2017

The former diesel air compressor, still in use in 2017, was operated 1.9 hours that year. Those hours were associated with emergency equipment testing. Given the Mediterranean climate in Los Angeles, the space heaters are typically used during the winter months, November through April.

5.3 Fuel Use Data

Using the operating assumptions in Table 4, fuel use was allocated to specific equipment for the purpose of developing maximum hourly and annual average emission inputs for HARP. The fuel use data is summarized in Table 5.

Table 5: Fuel Use and Process Rate by Source

Device Number	Name	Permit ID	Eqpt Size	Eqpt Units	Annual Process Rate*	Maxiumum Hourly Process Rate**	SCC Units	Operating Hours		
								Hours per day	Days per week	Weeks per year
1	ACID PLANT No. 4	D1 - D17 / C148	-	-	480,420	60.417	Tons 100% H2SO4	24	7	50
1	ACID PLANT No. 4	D1 - D17 / C148	-	-	280,052	41.667	Tons of Spent Acid Feedstock	24	7	50
2	PACKAGE BOILER	D99 / D139	49	Million BTU	4.08	0.047	Million cubic feet burned	24	1	10
3	START-UP HEATER	D98	50	Million BTU	3.686	0.042	Million cubic feet burned	15	1	8
4	FLARE, NON-REFINERY	C126	1.09	Million BTU	2.5926	0.0905	Million cubic feet burned	24	7	52
5	AIR COMPRESSOR	D100	180	HP	0.01064	0.0056	1000 gallons burned	2	1	1
6	CHANGE ROOM - HEATER	EXEMPT	90,000	BTU	0.0429	8.571E-05	Million cubic feet burned	8	7	26
7	CHANGE ROOM - WATER HEATER	EXEMPT	76,000	BTU	0.0386	7.236E-05	Million cubic feet burned	24	7	52
8	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
9	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
10	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
11	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
12	MAIN OFFICE - HEATER	EXEMPT	90,000	BTU	0.0225	8.571E-05	Million cubic feet burned	8	7	26
13	MAINTENANCE BLDG - HEATERS COMBINED	EXEMPT	680,000	BTU	0.1173	6.476E-04	Million cubic feet burned	8	7	26
14	SVE	DTSC PERMIT	-	-	70,560,000	15,000	Cubic feet	24	7	28

*Annual fuel records were used for all natural gas combustion sources; production data was used for the acid plant annual throughput; and the SVE operated only a portion of 2017. .
**Acid Plant process rate for H2SO4 and spend acide are shown separately

The package boiler and start-up heater have the largest consumption of natural gas. The non-industrial heaters and water heaters in the men's change room, main office and maintenance buildings have a collective rated capacity less than 1.4 MMBTU/hr.

5.4 Emission Summaries by Source

Using production rates (acid plant) and fuel usage data, emissions were developed for both maximum hour (for acute exposure purposes) and annual average emissions (for chronic exposure purposes). In terms of the industrial sources, during the maximum hour, it was assumed that all sources are operating. For annual emissions, the operating scenarios described above were utilized. For the non-industrial sources, the operating assumptions as described in Table 4 were utilized assuming that the maximum hour occurred during the day shift. Maximum hour and average annual emissions are summarized by both industrial and non-industrial source in Tables 6 and 7, respectively.

Table 6: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hour		Annual Average	
				lbs/hr	g/sec	lbs/yr	g/sec
1	D1	Acid Plant Furnace	HCl	0.007500	0.00094498	50.40936	7.25E-04
			Sulfuric Acid	1.0875	0.13702199	8647.56	1.24E-01
2	D139	Package Boiler	Benzene	0.0002726	3.4347E-05	0.0236988	3.41E-07
			Formaldehyde	0.0005781	7.2839E-05	0.0502578	7.23E-07
			Total PAHs (excluding Naphthalene)	0.0000047	5.9219E-07	0.0004086	5.88E-09
			Naphthalene	0.0000141	1.7766E-06	0.0012258	1.76E-08
			Acetaldehyde	0.0001457	1.8358E-05	0.0126666	1.82E-07
			Acrolein	0.0001269	1.5989E-05	0.0110322	1.59E-07
			Ammonia	0.1504	0.01894998	13.0752	1.88E-04
			Ethyl Benzene	0.0003243	4.0861E-05	0.0281934	4.06E-07
			Hexane	0.0002162	2.7241E-05	0.0187956	2.70E-07
			Toluene	0.0012455	0.00015693	0.108279	1.56E-06
			Xylenes	0.0009259	0.00011666	0.0804942	1.16E-06
3	D98	Startup Heater	Benzene	0.0002	3.0693E-05	0.0214	3.07E-07
			Formaldehyde	0.0005	6.509E-05	0.0453	6.52E-07
			Total PAHs (excluding Naphthalene)	0.0000042	5.2919E-07	0.0003686	5.30E-09
			Naphthalene	0.0000126	1.5876E-06	0.0011058	1.59E-08
			Acetaldehyde	0.0001302	1.6405E-05	0.0114266	1.64E-07
			Acrolein	0.0001134	1.4288E-05	0.0099522	1.43E-07
			Ammonia	0.1344	0.01693403	11.7952	1.70E-04
			Ethyl Benzene	0.0002898	3.6514E-05	0.0254334	3.66E-07
			Hexane	0.0001932	2.4343E-05	0.0169556	2.44E-07
			Toluene	0.001113	0.00014023	0.097679	1.40E-06
			Xylenes	0.0008274	0.00010425	0.0726142	1.04E-06
4	C126	Non-Refinery Flare	Benzene	0.0143895	0.00181304	0.4122283	5.93E-06
			Formaldehyde	0.1057945	0.01332981	3.030786	4.36E-05
			Total PAHs (excluding Naphthalene)	0.0002715	3.4208E-05	0.00777789	1.12E-07
			Naphthalene	0.0009955	0.00012543	0.02851894	4.10E-07
			Acetaldehyde	0.0038915	0.00049032	0.1114831	1.60E-06
			Acrolein	0.001	0.00011403	0.026	3.73E-07
			Ethyl Benzene	0.130682	0.01646557	3.743759	5.38E-05
			Hexane	0.0026245	0.00033068	0.0751863	1.08E-06
			Toluene	0.005249	0.00066136	0.1503726	2.16E-06
			Xylenes	0.0026245	0.00033068	0.0751863	1.08E-06
5	D100	Diesel Air Compressor	Benzene	0.00104328	0.00013145	0.00198223	2.85E-08
			1,3-Butadiene	0.00121744	0.00015339	0.00231314	3.33E-08
			Cadmium	8.400E-06	1.0584E-06	0.00001596	2.30E-10
			Formaldehyde	0.00966616	0.00121791	0.0183657	2.64E-07
			Hexavalent Chromium	0.00000056	7.0558E-08	1.064E-06	1.53E-11
			Arsenic	0.00000896	1.1289E-06	1.7024E-05	2.45E-10
			Lead	0.00004648	5.8564E-06	8.8312E-05	1.27E-09
			Nickel	0.00002184	2.7518E-06	4.1496E-05	5.97E-10
			Total PAHs (excluding Naphthalene)	0.00020272	2.5542E-05	0.00038517	5.54E-09
			Naphthalene	0.00011032	1.39E-05	0.00020961	3.01E-09
			Acetaldehyde	0.00438648	0.00055268	0.00833431	1.20E-07
			Acrolein	0.00018984	2.3919E-05	0.0003607	5.19E-09
			Ammonia	0.0045	0.00056447	0.0085	1.22E-07
			Copper	0.00002296	2.8929E-06	4.3624E-05	6.27E-10
			Ethyl Benzene	0.00006104	7.6909E-06	0.00011598	1.67E-09
			Hexane	0.00015064	1.898E-05	0.00028622	4.12E-09
			HCl	0.00104328	0.00013145	0.00198223	2.85E-08
			Manganese	0.00001736	2.1873E-06	3.2984E-05	4.74E-10
			Mercury	0.0000	1.4112E-06	0.0000	3.06E-10
			Selenium	0.00001232	1.5523E-06	2.3408E-05	3.37E-10
			Toluene	0.00059024	7.4369E-05	0.00112146	1.61E-08
			Xylenes	0.00023744	2.9917E-05	0.00045114	6.49E-09
			Diesel Exhaust Particulates	0.1876	0.02363708	0.3564	5.13E-06
14	DTSC Permit	SVE Extaction System	Perchloroethylene	0.01386	0.00174632	4.3061	6.1936E-05

Table 7: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Maximum Hour g/sec	Annual Average lbs/yr	Annual Average g/sec
6	1	Exempt	Comfort Heater Men's Changing Room	90K BTU/hr	Benzene	6.8568E-07	5.18363E-06	0.0003432	4.855E-09
					Formaldehyde	1.45707E-06	1.10152E-05	0.0007293	6.294E-07
					Total PAHs (excluding Naphthalene)	8.571E-09	6.47953E-08	0.00000429	3.702E-09
					Naphthalene	2.5713E-08	1.94386E-07	0.00001287	1.111E-08
					Acetaldehyde	3.68553E-07	2.7862E-06	0.00018447	1.592E-07
					Acrolein	2.31417E-07	1.74947E-06	0.00011583	9.996E-08
					Ammonia	0.000274272	0.002073451	0.13728	1.185E-04
					Ethyl Benzene	8.14245E-07	6.15556E-06	0.00040755	3.517E-07
					Hexane	5.39973E-07	4.08211E-06	0.00027027	2.332E-07
					Toluene	3.13699E-06	2.37151E-05	0.00157014	1.355E-06
					Xylenes	2.33131E-06	1.76243E-05	0.00116688	1.007E-06
7	1	Exempt	Water Heater Men's Changing Room	76K BTU/hr	Benzene	5.79041E-07	4.37745E-06	0.0003088	7.665E-07
					Formaldehyde	1.23046E-06	9.30207E-06	0.0006562	5.663E-07
					Total PAHs (excluding Naphthalene)	7.238E-09	5.47181E-08	0.00000386	3.331E-09
					Naphthalene	2.1714E-08	1.64154E-07	0.00001158	9.993E-09
					Acetaldehyde	3.11234E-07	2.35288E-06	0.00016598	1.432E-07
					Acrolein	1.95426E-07	1.47739E-06	0.00010422	8.994E-08
					Ammonia	0.000231616	0.001750978	0.12352	1.066E-04
					Ethyl Benzene	6.8761E-07	5.19822E-06	0.0003667	3.165E-07
					Hexane	4.55994E-07	3.44724E-06	0.00024318	2.099E-07
					Toluene	2.64911E-06	2.00268E-05	0.00141276	1.219E-06
					Xylenes	1.96874E-06	1.48833E-05	0.00104992	9.061E-07
8	5	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
9	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
10	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
11	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
12	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	6.8568E-07	5.18363E-06	0.00017968	1.551E-07
					Formaldehyde	1.45707E-06	1.10152E-05	0.00038182	3.295E-07
					Total PAHs (excluding Naphthalene)	8.571E-09	6.47953E-08	2.246E-06	1.938E-09
					Naphthalene	2.5713E-08	1.94386E-07	6.738E-06	5.815E-09
					Acetaldehyde	3.68553E-07	2.7862E-06	9.6578E-05	8.335E-08
					Acrolein	2.31417E-07	1.74947E-06	6.0642E-05	5.233E-08
					Ammonia	0.000274272	0.002073451	0.071872	6.203E-05
					Ethyl Benzene	8.14245E-07	6.15556E-06	0.00021337	1.841E-07
					Hexane	5.39973E-07	4.08211E-06	0.0001415	1.221E-07
					Toluene	3.13699E-06	2.37151E-05	0.00082204	7.094E-07
					Xylenes	2.33131E-06	1.76243E-05	0.00061091	5.272E-07
13	1	Exempt	Space Heater Maintenance Shop	30K BTU/hr (1 unit) 50 KBTU/hr (5 units) 100 KBTU/hr (4 units) (680 KBTU/hr combined) (Exhaust out of bldg ridge vent)	Benzene	5.18096E-06	3.91672E-05	0.0009384	8.098E-07
					Formaldehyde	1.10095E-05	8.32303E-05	0.0019941	1.721E-06
					Total PAHs (excluding Naphthalene)	6.4762E-08	4.8959E-07	0.00001173	1.012E-08
					Naphthalene	1.94286E-07	1.46877E-06	0.00003519	3.037E-08
					Acetaldehyde	1.72851E-07	9.28733E-07	0.00050439	4.353E-07
					Acrolein	1.74857E-06	1.32189E-05	0.00031671	2.733E-07
					Ammonia	0.002072384	0.015666878	0.37536	3.239E-04
					Ethyl Benzene	6.15239E-06	4.6511E-05	0.00111435	9.617E-07
					Hexane	4.0800E-06	3.08442E-05	0.00073899	6.377E-07
					Toluene	2.37029E-05	0.00017919	0.00429318	3.705E-06
					Xylenes	1.76153E-05	0.000133168	0.00319056	2.753E-06

The source of sulfuric acid and hydrochloric acid is the acid plant stack. The major combustion TACs emanate from the package boiler and startup heater. The air compressor contributes a minor source of diesel combustion TACs as it operated less than two hours in 2017. Emissions from the SVE unit, estimated with the assumption that the highest measured concentration was released over its entire 2017 operating schedule, contributed less than 4.3 lbs. of PCE.

Table 8 presents maximum hourly and total annual facility pollutants by TAC.

Table 8: Maximum hourly and Annual Emission by Air Toxic Pollutant

Pollutant	TAC ID	Pol ID	Annual lb/yr	Hr Max lb/hr
PAHs	19	1151	0.008972371	0.000483247
Diesel Exhaust PM	72	9901	0.35644	0.1876
Formaldehyde	12	50000	3.150206	0.11657699
Benzene	2	71432	0.461856932	0.015959159
Acetaldehyde	29	75070	0.145291342	0.008556689
Naphthalene	19	91203	0.031156478	0.001132902
Ethyl Benzene	40	100414	3.800552226	0.131369228
1,3-Butadiene	4	106990	0.002313136	0.00121744
Acrolein	30	107028	0.048138377	0.001338575
Toluene	68	108883	0.369204317	0.008244309
Hexane	44	110543	0.113246646	0.003192556
Perchloroethylene	18	127184	4.3061	0.01386
Xylenes	70	1330207	0.237479756	0.004649849
Lead	15	7439921	0.000088312	0.00004648
Manganese	49	7439965	0.000032984	0.00001736
Mercury	50	7439976	0.00002128	0.0000112
Nickel	17	7440020	0.000041496	0.00002184
Arsenic	14	7440382	0.000017024	0.00000896
Cadmium	5	7440439	0.00001596	8.4E-06
Copper	36	7440508	0.000043624	0.00002296
HCl	46	7647010	50.411342	0.008543
Ammonia	32	7664417	25.906432	0.293351616
Sulfuric Acid	67	7664939	8647.56	1.0875
Selenium	64	7782492	0.000023408	0.00001232
Chromium, Hexavalent	13	18540299	0.000001064	0.00000056

In the maximum hour, sulfuric acid and diesel exhaust particulate predominate. The terms of annual emissions, sulfuric acid is still the dominant pollutant, followed in descending order by perchloroethylene and ammonia.

6.0 REFERENCES

California Air Resources Control Board. Hot Spots Analysis and Reporting Program (HARP). http://www/arb/ca/gov/toxics/harp/harp.htm

Correspondence dated June 12, 2007 between Doug Gordon of SCAQMD and Robert Brown of Eco services. Transmittal a copy of the approved protocol for Emission Compliance Testing and Continuous Emission Monitoring Certification.

Correspondence to Eco Services Operations Corp from Victoria Moaveni of SCAQMD regarding Quadrennial Air Toxics Emissions Inventory Reporting and Calendar year 2017 Annual Emissions Reporting/Fees, dated December 20, 2017.

Correspondence to Stephen Caro of Eco Services Operations Corp from Tracy A. Goss from SCAQMD Planning and Rules, entitled Notice to Prepare Air Toxics Inventory Report or Voluntary Risk Reduction Plan for Eco Services Operations Corp. (South Coast AQMD ID# 180908, dated December 10, 2019

Eco Services Air Emissions Report for 2017.

Email correspondence dated April 30, 2014 between Eco Services and SCAQMD permit writer Stephan Jiang regarding removal of the gasoline tank and dispensing system from the Title V permit.

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https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/2-industrial-processes/2-b-chemical-industry/2-b-chemical-industry

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Office of Environmental Health Hazard Assessment (OEHHA). Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, March 2015.
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SCAQMD. Supplemental Instructions - Reporting Procedures for AB2588 facilities Reporting Their Quadrennial Air Toxic Emission Inventory in the Annual Emission Reporting Program, December 2016.
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LIST OF APPENDICES

A. **Sulfuric Acid Source Test Data Information**

B. **Hydrochloric Acid Emission Factor Information**

C. **Gasoline Tank Removal Documentation**

D. **Summary of SVE Monthly Monitoring Data and Emission Calculation Basis**

Appendix C
2017 ATIR Emissions

ECO SERVICES DOMINGUEZ FACILITY - REVISIONS TO 2017 ATIR
(*October 22, 2021)*

Eco-Services' original ATIR was submitted to SCAQMD on May 6, 2020. This memo outlines changes made to the 2017 ATIR, as requested by Staff Engineer Pierre Sycip upon review of the ATIR (email communication dated July 14, 2021) and requested in a subsequent review (email communication dated October 19,2021). The follow paragraphs present the requested changes and the revised ATIR report tables are included as an addendum.

Sulfuric Acid Plant No. 4 (D1-D17 & C148) HCl Control Efficiency
ATIR Device 1, Process 2, Stack 1

HCl emissions for the Dominguez Sulfuric acid plant are calculated based on source test emissions from a similar EcoServices Plant. These emission calculations and source test data showed a control efficiency of 99.91% for HCl. SCAQMD staff has reviewed the source test data used as the basis for these calculations and requested that Ecoservices use an alternate lower control efficiency of 99% for the Eco Services Corporation Dominguez Facility Air Toxics Emission Inventory Report (ATIR) and HRA. There are no new pollutants from this device or process resulting from this emission factor change; simply an increase in the reported hourly and annual HCl emission rates. Process rates (tons of spent acid processed), hours of operation and uncontrolled emission factors (based on <0.01% Cl- in the waste acid) used to calculate the emissions remain unchanged. The emission factor is derived as follows:

Uncontrolled Emissions = 0.0001 lb HCl/lb waste acid*2000 lb/ton = 0.2 lb HCl/ton spent acid feedstock
Assume 99% HCl control efficiency
Controlled Emissions = 0.2*(1 -0.99)

HCl Emission Factor = 0.002 lb HCl/ton spent acid feedstock

Furnace (D1) Natural Gas Burner Combustion Emissions.
Device 1, Process 3, Stack 1.

The main acid furnace air toxic emissions quantified for annual air emission inventories and prior ATIRs have historically been limited to the emissions of acid gases (H2SO4 and HCl). The acid combustion in the furnace is assisted by two (2) 75 MMBtu/hour low NOx burners. The gas exhausting the combustion burners is treated by numerous exhaust gas processing devices (quench tower, gas cooling tower, gas drying tower) and multiple control devices including a dual stage electrostatic precipitator, acid absorption towers and a caustic wet scrubber before it is finally vented to the atmosphere (through the wet gas scrubber exhaust stack).

For completeness purposes, SCAQMD has requested inclusion of these auxiliary emissions in the ATIR. Since the control efficiency of the downstream control devices is difficult to estimate accurately and varies between different contaminants depending on solubility and volatility, Ecoservices has conservatively included these pollutants as uncontrolled emissions. Emissions factors are based on Natural Gas Combustion from External Combustion Boilers/Process Heaters rated between 10-100 MBTU/hr. This revision involves the addition of emissions from 10 TACs to the exhaust of Stack 1. Ammonia was not included in the emission factors because 1) there is no SCR or other control devices that utilize ammonia, and 2) any ammonia emissions generated during combustion would react with H2SO4 and be eliminated. Process rates for hourly emissions are based on the maximum heat input of two burners at 75 MMBtu/hr. Process rates for annual emissions are based on the annual natural gas consumed by the process which was determined by facility gas bills, subtracting the usage from the other permitted and exempt natural gas emission sources. The gas burners are assumed to operate the same hours as the acid plant combustion or 24 hours per day, 7 days per week, 50 weeks per year, allowing for plant maintenance and down time.

Device 14, Process 1. Soil Vapor Extraction System.

The 2017 ATIR contained emissions from perchloroethylene from a permitted soil vapor extraction system. The emissions included in the original ATIR (May 2021) were conservatively calculated for a single pollutant, perchloroethylene which is overwhelmingly the main contaminant of concern in terms of health risk. The

perchloroethylene emissions were based on a mass balance based on the 2017 recorded VOC quantity captured by the dual carbon adsorption system. This approach assumed all VOC captured was perchloroethylene and utilized a lower-end control efficiency in order to conservatively estimate (err on the high side) air emissions. Revised calculations include emissions from other trace contaminants included in the sampling report data, as per SCAQMD request. Since this calculation method speciates the VOC emissions, annual emission estimates were calculated using the analytical monthly reporting results for individual chemicals.

Hourly emissions estimates were calculated using the same methodology as before, based on the maximum detected sampling data (4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operations Corp Dominguez Plant, Carson, CA) and the SVE process exhaust flow rate. Annual emissions are calculated from the average reported concentration of pollutant in the effluent of the adsorber from monthly grab sample analytical results and the SVE design gas flow rate (250 cfm or 15,000 cubic feet per hour). In the majority of the monthly grab samples, emissions of the pollutants in the effluent of the carbon adsorber were listed as being non-detectable and below reporting limits. However, these same pollutants **were** detected at the inlet to the adsorber and could not be assumed to be absent. In cases where the pollutant was detected but concentrations were below the reporting limit, the pollutant concentration was conservatively assumed to be equal to the reporting value listed on the test result summary. This approach is overly conservative and overestimates impact of these trace pollutants; however, the reporting and detection limits of these trace compounds are quite low. Concentrations were tabulated from "Table 3 – Summary of SVE System Analytical Results" in the 4th Quarter SVE 2017 System report. A copy of this table is included here as a reference.

Design exhaust flow rate is 250 acfm or 15,000 ft3 per hour. The system operated January, February and August through December of 2017 for a total of 4704 hours.

Device 15, Process 1. Sulfur Handling/Unloading

The ATIR was also updated to include emissions of H2S that occur from the Sulfur Handling System. Emissions of H2S from the sulfur handling/unloading facility are minimal as the Sulfur received and utilized at Ecoservice is degassed and has very low levels of H2S. Calculations for H2S emissions are based on degassing to a level of 10 ppmw, an upper bound in terms of concentration and a well-documented industry standard for degassing levels. H2S emissions from the sulfur unloading system were calculated assuming that emissions occur during the displacement of the H2S in the vapor space above the molten sulfur based on the vapor concentration in equilibrium with the sulfur at 300 degrees F. Derivation of the H2S emission factor based on equilibrium of H2S and displacement of vapor via sulfur handling are included in the attachment. The vapor displacement volume is based on the density of molten sulfur and the maximum hourly and annual rates of sulfur handling/unloading at the facility. The maximum hourly sulfur rate is based on two trucks per hour (24 LTN per truck) and 2017 annual sulfur deliveries of 49,885 LTN per year

Table and Figure Addenda

Table 1: Source Location (Addendum)

Stack	Description	UTME	UTMN	Zone	Datum
15	Sulfur Unloading	385829	3745465	11	WGS 84

Sulfur handling system emissions are represented as an area source at Sulfur Pit, Permit ID D130.

Table 3: Emission Factors by Source (Addendum)

Source #	Permit ID	Process Description	CAS	TAC Name	Factor	Units	Emission Estimation Method
1	D1	Acid Plant Furnace	7647010	HCl	0.002	LB/TON SPENT ACID FEED	Source Testing Result (Measured) Engineering calculations Based on incineration data from process specific feedstock, SCAQMD Specified Control Efficiency
1	D1	Acid Plant – Natural Gas Low Nox Burners – 2 @ 75 MMBtu/hr	71432 50000 1151 91203 75050 100414 100543 108883 1330207	Benzene Formaldehyde Total PAHs (excluding Naphthalene) Naphthalene Acetaldehyde Ethyl Benzene Hexane Toluene Xylenes	0.0058 0.0123 0.0001 0.0003 0.0031 0.0069 0.0046 0.0265 0.0197	LB/MMSCF	AB2588 Reporting Guidance Appendix B, Table B-1 Default EF Boiler/Heater 10-100 MMBTU/Hr
14	D153 C152	Vapor Extraction Well And Adsorber	127184 79016 56235 67663 75014 75343 108883 71432 67630 75092 1330207 100414 71556 100425	Perchloroethylene Trichloroethylene Carbon tetrachloride Chloroform Vinyl chloride 1,1-dichloroethane Toluene Benzene Isopropyl alcohol Methylene chloride Xylenes (p/m/o) Ethylbenzene 1,1,1-trichloroethane Styrene	14,000 1,800 45 73 18 28 27 16 180 29 31 31 39 31	UG/M3 (Max Detected)	Mass balance using SVE Sampling data from 4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operation Corp Dominguez Plant, Carson, CA Hourly flow based on design flow of 250 acfm
14	D153 C152	Vapor Extraction Well And Adsorber	127184 79016 56235 67663 75014 75343 108883 71432 67630 75092 1330207 100414 71556 100425	Perchloroethylene Trichloroethylene Carbon tetrachloride Chloroform Vinyl chloride 1,1-dichloroethane Toluene Benzene Isopropyl alcohol Methylene chloride Xylenes (p/m/o) Ethylbenzene 1,1,1-trichloroethane Styrene	1,614 227 26 28 10 16 15 8 105 19 21 23 28 20	UG/M3 (Average of Sampling Data)	Mass Balance using SVE Sampling data from 4th Quarter 2017 Soil Vapor Extraction System Report, Eco Services Operation Corp Dominguez Plant, Carson, CA Average includes non-detect in effluent based on Reporting Limits Hourly Flow based on design flow of 250 acfm And 4704 hours of operation in 2017
15	D130	Sulfur Pit	7783064	Hydrogen Sulfide	9.29E-3	LB/LTN SULFUR	Engineering Calculations based on Equilibrium and Mass Balance/Displacement of Vapor

Table 4: Operating Assumptions by Source (Addendum)

Source	Hrs/Day	Days/Wk	Wk/Yr	Comments
Acid Plant Furnace*	24	7	50	The acid plant is shut down 2 weeks per year for O& M
SVE System	24	7	28	The SVE system was in operation Jan - Feb and August -December of 2017
Sulfur Unloading	24	7	50	Sulfur Deliveries are unscheduled and can occur during day and night-time hours

*Hours for Acid Plant Furnace and SVE System remain unchanged. Information is provided here for informational purposes for the purpose of emission calculations.

Table 5: Fuel Use and Process Rate by Source (Addendum)

Device Number	Name	Permit ID	Eqt Size	Eqpt Units	Annual Process Rate	Maximum Hourly Process Rate	SCC Units
1*	Acid Plant No. 4	D1-D17/C148			280,052	41.667	Tons of spent acid feedstock
1	Acid Plant No. 4 Low NOx Burners	D1-D17/C148	2 @ 75	MMBTU/hr	636.9	0.1428	MMSCF Natural Gas Burned
14	SVE System	D153/C152			70,560,000	15,000	STANDARD CUBIC FEET
15	Sulfur Pit	D130			49,885	48	Long Ton (LTN)

(*) Acid Plant Feedstocks rates remain unchanged. Information provided with addendum for calculational purposes only.

Table 6: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	**Permit ID**	**Process Description**	**Pollutant**	**Maximum Hourly Lbs/hr**	**Annual Average Lbs/yr**
1, Process 2	D1-D17/C148	Acid Plant No. 4	HCl	0.08333334	560.104
1, Process 3	D1-D17/C148	Acid Plant Furnace Natural Gas Burners - Natural Gas Combustion	Benzene	0.0008282	3.69402
			Formaldehyde	0.0017958	7.83387
			Total PAHs (excluding Naphthalene)	1.43E-05	0.06369
			Naphthalene	4.28E-05	0.19107
			Acetaldehyde	0.0004427	1.97439
			Ethyl Benzene	0.0009853	4.39461
			Hexane	0.0006569	2.92974
			Toluene	0.0037842	16.87785
			Xylenes	0.0028132	12.54693
14	D153/ C152	SVE System	Perchloroethylene	0.01311	7.112448
			Trichloroethylene	0.00169	0.99913
			Carbon tetrachloride	4.21E-05	0.115225
			Chloroform	6.84E-05	0.124115
			Vinyl chloride	1.69E-05	0.042809
			1,1-dichloroethane	2.62E-05	0.072536
			Toluene	2.53E-05	0.064774
			Benzene	1.50E-05	0.036021
			Isopropyl alcohol	0.000169	0.464003
			Methylene chloride	2.72E-05	0.084672
			Xylenes (p/m/o)	2.90E-05	0.092998
			Ethylbenzene	2.90E-05	0.101324
			1,1,1-trichloroethane	3.65E-05	0.124821
			Styrene	2.90E-05	0.089893
15	D130	Sulfur Unloading	Hydrogen Sulfide	0.44544	462.9328

Emission Factor - Equilibrium Calculations for Sulfur Unloading

Sulfur is degassed to Industry Standard of <= 10 ppmw H2S			
Melting Point of Sulfur	235	F	694.67 R
Temperature of Molten Sulfur	**300**	**F**	**759.67 R**
Density of Sulfur at Melting Point	1.819	g/cm3	
	113.506	lb/ft3	
Molecular weight of H2S	34.1	lb/lb-mole	

Reference: **Table 3: Equilibrium Vapor Space H2S Concentration above S with no purge**

ppmw total H2S in loaded sulfur	Equilibrium temperature (F)	vol% H2S in vapor space
10	300	0.7

From: Hazards of Molten Sulfur Storage and Handling, Proceedings of the 53rd Annual Laurance Reid Gas Conditioning Conference, Feb 23-26, 2003.
Johnny B. Johnson and Nathan Hatcher.

Calculate the density of H2S in equilibrium in vapor space using volume percent and ideal gas law.

0.007 PV = n RT

n/V= 0.007 P/RT

$$\frac{m}{V}\ (lb/ft^3) = \frac{0.007\ P\ *\ MW(H2S)}{R\ T}$$

$$\text{density H2S } (lb/ft^3) = \frac{0.007 * 1\ atm * 34.1\ lb/lb\text{-}mole}{0.7302413\ ft^3\ atm/(R\text{-}lb\text{-}mole) * (759.67\ R)}$$

density = 0.00047 lb/ft3

EMISSION FACTOR - TRANSFER/DISPLACEMENT OF VAPOR FROM SULFUR UNLOADING

BASIS: 1 LTN (LONG TON) SULFUR TRANSFERRED

2,240	LB S - TRANSFERRED
2,240	LB S/113.50 LB/FT3
19.73	FT3 DISPLACED PER LTN
19.73	FT3*0.00047 LB H2S/FT3
9.28E-03	LB H2S EMITTED/LTN SULFUR UNLOADED

WEIGHT OF DELIVERIES PER YEAR (LTN)	NUMBER OF DELIVERIES PER YER	SULFUR PER DELIVERY (LTN)	AVG DAILY DELIVERIES	MAX HOURLY DELIVERIES
49,885	2251	22.2	6.4	2

SULFUR DELIVERIES	S THROUGHPUT (LTN)	H2S EMISSIONS (LB)	UNITS
ANNUAL	49885	463	LB/YR
DAILY	142.5	1.32	LB/DAY
DELIVERY	22.2	0.21	LB/DELIVERY
HOUR	48	0.45	LB/HR

AIR TOXICS "HOT SPOTS" INFORMATION AND ASSESSMENT ACT (AB2588)
AIR TOXICS INVENTORY REPORT

FOR

ECO SERVICES OPERATIONS CORP.
20720 S. WILMINGTON AVENUE
CARSON, CALIFORNIA

(FACILITY ID #180908)

Submitted to:
South Coast Air Quality Management District

Prepared by:
Pika Environmental, LLC
4065 Woodman Canyon
Sherman Oaks, CA

May 2020

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1.0 BACKGROUND AND PURPOSE

1.1 Background

The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB2588) established a statewide program for the inventory of air toxics emissions from individual facilities as well as requirements for risk assessment and public notification of public health risk. The elements of AB2588 are contained in the California Health and Safety Code (Section 44300, et al.) and the California Code of Regulations (Section 93300, et al). Section 44360(a) requires the South Coast Air Quality Management District to prioritize facilities based on the submitted emission inventories and then place them into one of three categories: high, intermediate, and low priority. Facilities designated as high priority are required to submit Health Risk Assessments to assess the risk to their surrounding community. Facilities ranked with an intermediate priority are considered "District Tracking" facilities, which are then required to submit a complete toxics inventory once every four years. Facilities ranked as low priority are exempt from reporting.

Eco Services Operations Corp (Eco Services) has completed "quadrennial" emissions inventories since the beginning of the AB2588 program. In 2006, at SCAQMD's request, a Health Risk Assessment (HRA) was conducted based on the facility's Fiscal Year 2001-2002 emissions. The submitted HRA utilized the State of California Air Resources (CARB's) "Hot Spots" Analysis and Reporting Program (HARP) which streamlines emission inventories and risk assessment requirements into a single integrated analysis tool. The results of the previous HRA indicated that cancer risk to the maximum exposed individual worker and resident were well below the significance threshold of 10 in a million. In addition, the maximum potential acute and chronic health impacts were below the Hazard Index of 1, a threshold requiring public notification.

1.2 Purpose

In December of 2019, Eco Services was notified by the SCAQMD that it is required to submit either an Air Toxics Inventory Report (ATIR) or a Voluntary Risk Reduction Program, because it was given a priority score of greater than 1, based on their most recent AB2588 quadrennial emissions report from 2017. Since the facility has identified few additional opportunities to further reduce risk, it has elected to submit an ATIR. This ATIR incorporates the March 2015 changes to OEHHA's Health Risk Assessment Guidelines for estimating health risk, as well as changes to District Rule 1402.

The ATIR is organized in the outline format specified in Appendix A of the SCAQMD's AB2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidance for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act).

Section 2 of the report presents basic facility information, including facility name general location, products produced and surrounding land use. Section 3 provides process descriptions by process line. Section 4 presents a description of the facility layout, the source types and functions within the facility, source locations by UTMs, and Toxic Air Contaminants (TACs) associated with each source. Section 5 provides source characterization data, including emission factors employed, whether the factor was estimated or measured, as well as annual average and worst hour emissions. The Appendix provides supporting documentation such as source tests, and agency approval letters for source test protocols, and other information used to determine air toxic sources and develop emissions.

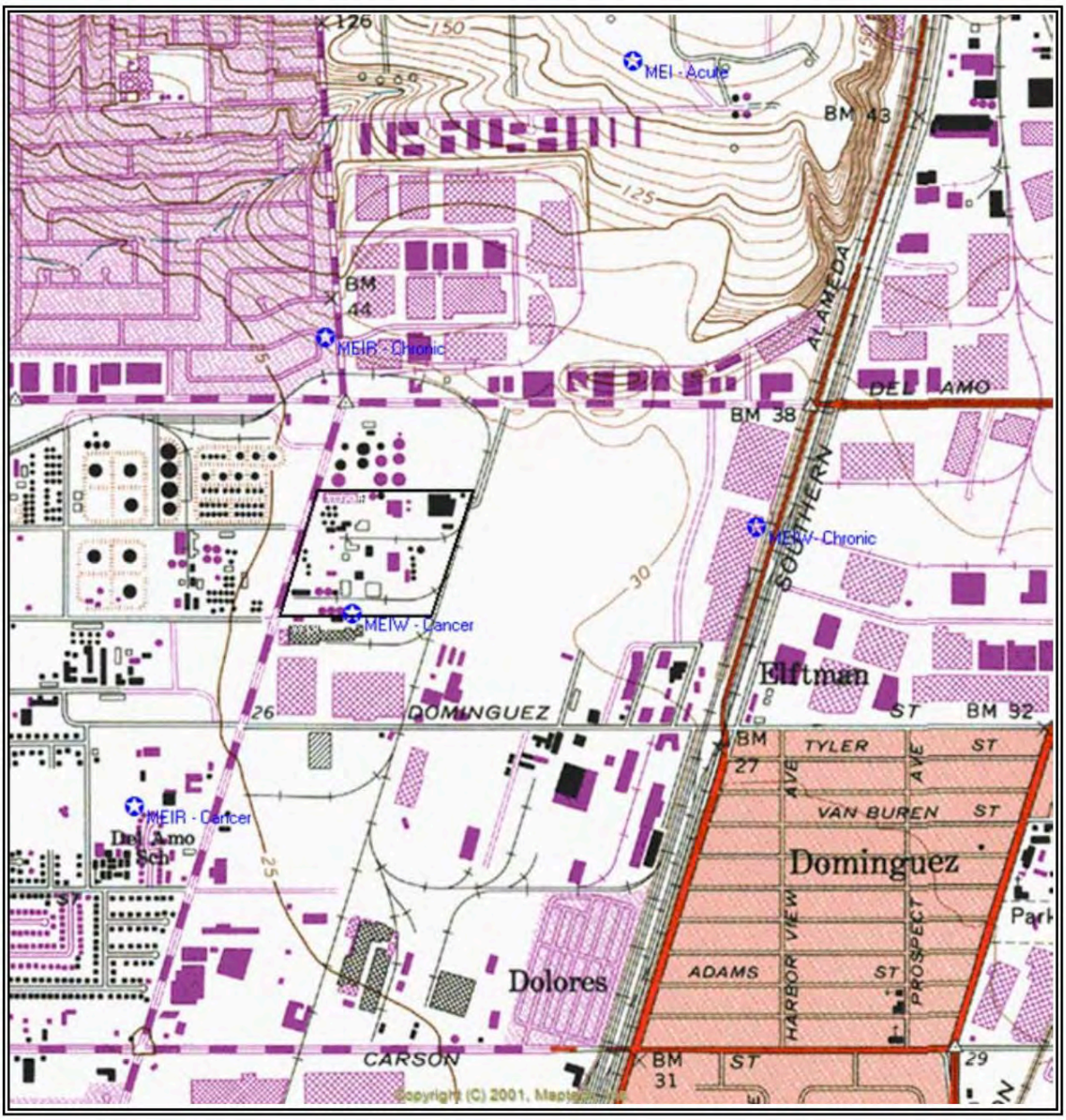
In addition to the written portion of the ATIR, the Eco Services submittal includes a file, submitted through the SCAQMD Drop Box site, containing the EIM portion of HARP populated with the facility, device, process emissions and stack data required under the guidelines.

2.0 FACILITY INFORMATION

The Eco Services Dominguez facility (SCAQMD Facility ID 180908) is located at 20720 Wilmington Avenue, Carson, CA. The facility is within the jurisdiction of the City of Carson and is surrounded by industrial land use in all directions. The topography of the area is relatively flat as the facility is situated in the coastal plain, approximately 6 miles from the Pacific Ocean. The land use in the area is considered urban. Figure 1 shows the location of the Eco Services facility and its property line relative to the surrounding area, including Wilmington Avenue (on the western boundary of the facility) and the San Diego Freeway to the west and south of the facility.

The land use surrounding the facility is heavily industrial. Several refineries and chemical plants abut the facility. The land to the east of the facility includes warehousing operations. Nearby residential neighborhoods are located to the west of Wilmington Avenue: the nearest resident is immediately north of Del Amo Boulevard. The nearest elementary school is Del Amo Elementary, situated near the intersection of 213th and Water Streets.

Figure 1: SITE PLAN AND LOCATION OF MAXIMUM IMPACTS



3.0 PROCESS DESCRIPTION BY PRODUCT LINE

Eco Services produces two main product lines in their Dominguez facility: sulfuric acid and aluminum sulfate. Sulfuric acid is the largest volume chemical manufactured in the United States and is used in many industries. The largest volume sulfuric acid customers for the Dominguez Plant are refineries who use sulfuric acid as a catalyst in their alkylation process. The aluminum sulfate solution is used primarily in the water treatment and paper manufacturing industries.

3.1 Sulfuric Acid Production

Sulfuric acid at this site is manufactured in a regeneration sulfuric acid process. Regeneration means that spent sulfuric acid is converted back into fresh sulfuric acid. The strengths of sulfuric acid produced at this site range from 93 to 99%.

Spent sulfuric acid from refinery alkylation and elemental sulfur are burned in a natural gas fired furnace. The combustion products, including approximately 10% sulfur dioxide, pass through a waste heat recovery boiler that generates all the steam needed at the site. The main steam user is the turbine driving the main gas blower for the process. Surplus steam is diverted to an on-site electrical co-generation unit.

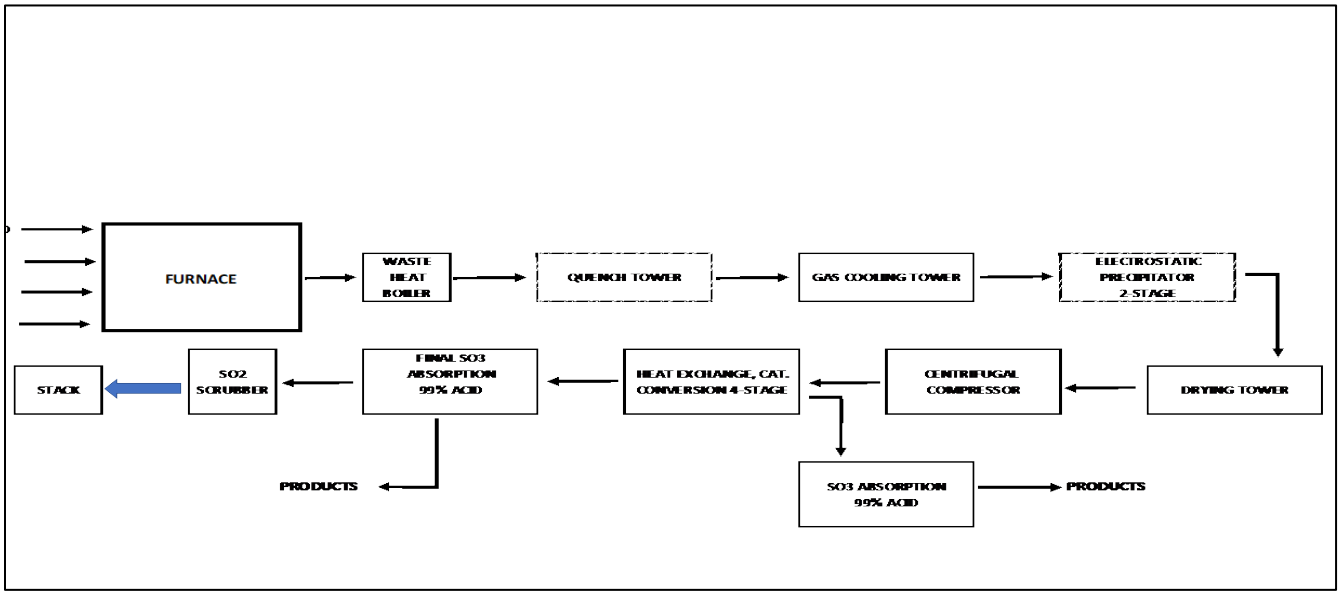
Process gas exiting the waste heat boiler is further cooled and cleaned in a quench tower, gas cooling tower, and a dual stage electrostatic precipitator. The gas is then dehumidified in a strong acid-drying tower before the gas passes through the steam turbine driven main gas blower. The sulfur dioxide gas is then catalytically oxidized to sulfur trioxide in four-stage converter/heat exchanger set. The intermediate and final strong acid absorption towers trap the sulfur trioxide and produce 99% sulfuric acid solution.

The tail gas leaving the final absorption tower typically contains about 200 ppm sulfuric dioxide that is further reduced to 5 ppm in a 2-stage caustic scrubber. The sulfur dioxide reacts with the caustic solution to form sodium salts. The sodium salt solution is acidulated

to form sodium sulfate, stripped to remove sulfur dioxide, and discharged to the wastewater treatment system for disposal. The remaining gas, consisting of nitrogen, oxygen, carbon dioxide and small quantities of sulfur dioxide and nitrogen oxides, is vented to the atmosphere through a wet gas scrubber exhaust stack.

Figure 2 shows a block flow diagram of the sulfuric acid plant in which the demisters are labeled.

Figure 2: Sulfuric Acid Plant Block Flow Diagram



3.2 Aluminum Sulfate Production

Aluminum sulfate solution is made in a batch process by blending fine aluminum trihydrate powder, sulfuric acid, and water in a heated and agitated reactor for several hours. The batch settles overnight and the finished product is decanted off the top of the reactor and pumped to storage. Filtration is provided for the material in the finished product storage tank and for the loading area. Byproduct aluminum sulfate solution is also received from other companies. The process normally operates during day shift only but on occasion will operate two shifts per day during a peak demand period.

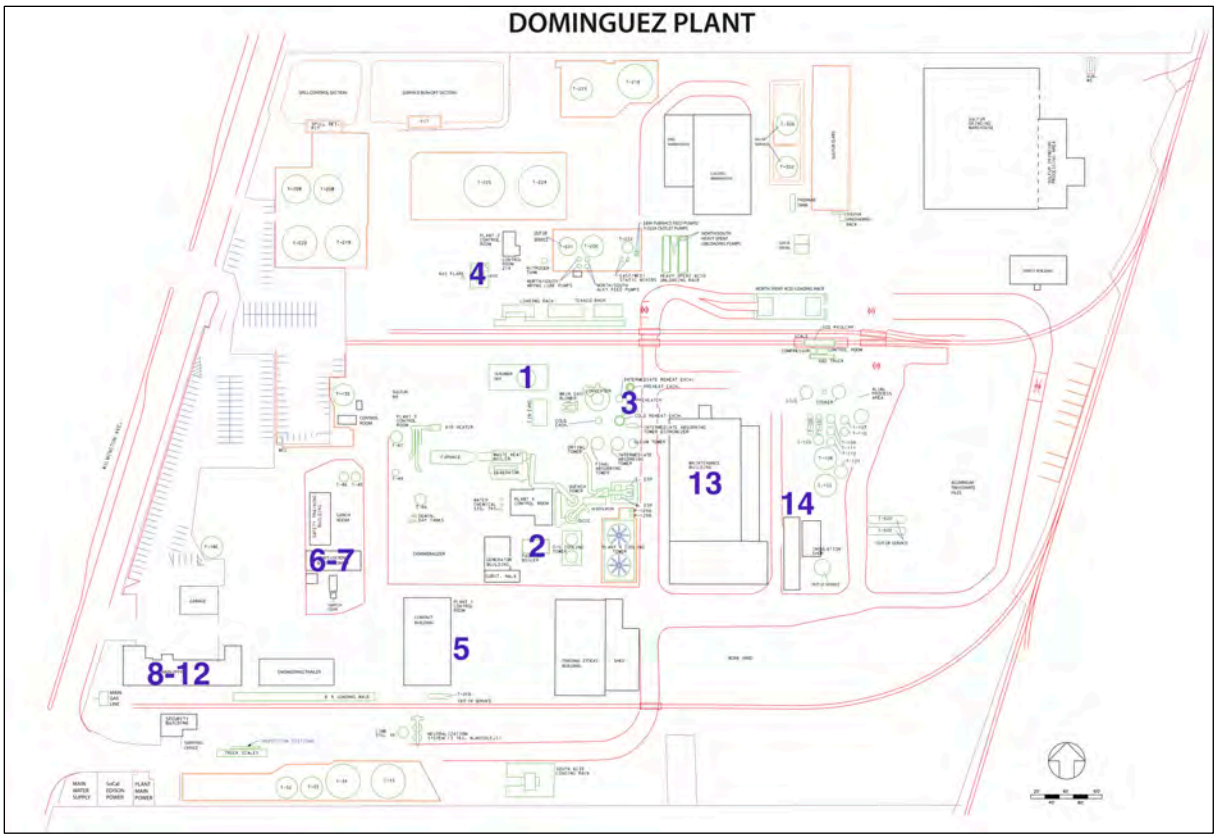
4.0 SOURCE CHARACTERIZATION

Section 4 provides general information on the Eco Services facility layout and detailed descriptions of the sources that have the potential to produce air toxics at the site. This section also describes sources present on the site without the potential to produce toxics, along with the rationale for why these sources were excluded from the ATIR inputs.

4.1 Facility Layout

Figure 3 shows a more detailed plot plan of the facility. The northern portion of the site is used for raw material storage and warehousing and loading racks for sulfuric acid. At the eastern boundary is situated the aluminum production line. Just west of center of the site is the sulfuric acid production line. Various buildings for employees are present in the southwest corner of the site, including the main office, shipping, security, the engineering trailer, the maintenance building and the men's locker room. Most of the western portion of the site is reserved for parking.

Figure 3: Eco Services Plot Plan



4.2 Source Types and Locations

Figure 3 also shows the distribution of sources throughout the site. The types of air toxic emission sources and their respective permit IDs (where applicable) are as follows:

Source 1: Acid Plant (D1-17)
Source 2: Package Boiler (D139)
Source 3: Startup Heater/Preheater (D98)
Source 4: AVS Flare (C126)
Source 5: Diesel Air Compressor (former D100)
Source 6 &7: Water Heater and Comfort Heater in the Men's Changing Room (Rule 219 Exempt)
Source 8 through 12: HVAC Units in the Main Office Building (Rule 2019 Exempt)
Source 13: Maintenance Building Space Heaters (Rule 219 Exempt)
Source 14: SVE Extraction Treatment System (permitted by DTSC)

Other air emission sources that produce criteria pollutants but not air toxics include the cooling tower (D16) and the aluminum trihydrate unloading system (D37-D44). As described in the following paragraphs, the gasoline tank was removed from the site in 2014 and its emissions will be excluded from the ATIR.

Table 1 provides a list of the sources and their UTM locations. Building locations and dimensions were also developed for input purposes. These source location and building downwash data have been loaded into the HARP EIM portion of the ATIR.

Table 1: Source Locations

Stack		UTME	UTMN	Zone	
1	Sulfuric Acid Plant	385872	3745481	U11	WGS84
2	Package Boiler	385891	3745408	U11	WGS84
3	Process Heater	385932	3745476	U11	WGS84
4	AVS Flare	385859	3745524	U11	WGS84
5	Diesel Air Compressor	385857	3745367	U11	WGS84
6	Change Room - Heater	385793	3745402	U11	WGS84
7	Change Room - Water Heater	385795	3745405	U11	WGS85
8	Office - Heater 1 Stack	385720	3745355	U11	WGS86
9	Office - Heater 2 Stack	385730	3745355	U11	WGS87
10	Office - Heater 3 Stack	385740	3745355	U11	WGS88
11	Office - Heater 4 Stack	385750	3745355	U11	WGS89
12	Office - Heater 5 Stack	385760	3745355	U11	WGS90
13	Maintenance Bldg Ridge Vent	385963	3745436	U11	WGS91
14	SVE	386008	3745420	U11	WGS92

4.3 Source-Specific Descriptions:

Each source listed above is described below in terms of their types of TAC emissions and hours of operation.

Sulfuric Acid Plant

Emissions of interest from the sulfuric acid process include sulfur dioxide, nitrogen oxides, and aerosol sulfuric acid mist. Information on each is discussed below.

Sulfur dioxide emissions are well controlled with the double absorption system and the tail gas caustic scrubber. Sulfur dioxide emissions are regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfur dioxide emissions are limited to 4 pounds of sulfur dioxide per ton of sulfuric acid produced. A tighter limit is in the site's Title V facility permit as a result of a Consent Decree with the EPA that further limits sulfur dioxide emissions to 3.5 lbs of sulfur dioxide per ton of sulfuric acid produced. Sulfur dioxide emissions are actually much lower than this limit. The caustic scrubber, installed to comply with reduced sulfur dioxide allowances under RECLAIM, has enabled the site to reach very low sulfur dioxide emissions.

Nitrogen oxide emissions from sulfuric acid plants are not regulated under any federal regulations. The site complies with RECLAIM allowances using low NOx burners on the furnace and maintaining an adequate allocation.

Aerosol sulfuric acid mist emissions are considered particulates and regulated at the federal level under 40 CFR Part 60 Subpart H, Standards of Performance for Sulfuric Acid Plants. Sulfuric acid mist emissions are limited to 0.15 pounds of sulfuric acid mist per ton of sulfuric acid produced. Actual emissions are in the range of 0.018 lbs of sulfuric acid mist/ton of acid produced. Aerosol sulfuric acid mist generated in the process is controlled by glass fiber demisters installed in the upper section of the strong acid absorption towers.

Testing for sulfuric acid mist is performed once per year using EPA Test Method 8. Table 2 provided below summarizes the results of this testing over the last 5 years.

Table 2: Measured Sulfuric Acid Mist Levels

Date	Sulfuric Acid Mist #/Ton of H_2SO_4 Produced*	Sulfuric Acid Mist Standard
7/30/2019	0.016	0.15
8/1/2018	0.022	
8/8/2017	0.018	
8/2/2016	0.017	
2/4/2015	0.016	

*Based on annual source test data

These results show that aerosol sulfuric acid mist emissions are consistently far below the allowable regulatory standard. The 2017 source test report that serves as the basis for the sulfuric acid emission factor is provided in Appendix A of this report.

There are chloride contaminants in the spent sulfur acid feedstock at the Dominguez plant, like that present in spent acid feedstocks in Eco Services' Houston and Baton Rouge plants. The Houston and Baton Rouge plants, facilities with identical process equipment to Dominguez, have conducted trial burns to determine HCl removal efficiency of test wastes. The feedstock utilized in one of the trial burns closely resembles the typical chloride content experienced at the Dominguez facility and was used to determine HCl removal efficiency and estimate residual HCl emissions. The trial burn data that forms the basis of this estimate, as well as the emission calculations, are provided in Appendix B of the ATIR. Aerosols of hydrochloride emissions are estimated at 0.00018 lbs/ton of spent acid feedstock.

Package Boiler

The package boiler has a permitted capacity of 49 million BTUs per hour. This boiler generates high-pressure superheated steam. This boiler is operated only when the sulfuric acid process is down or in the start-up mode since the sulfuric acid process generates all necessary steam when operating. This boiler uses a low NOx burner to keep NOx emissions below the permit limit of 36.855 ppm.

Start-up Heater

The start-up heater system has a rated capacity of 50 million BTUs per hour. The system consists of a preheat furnace and a preheat exchanger. The start-up heater system is used when the sulfuric acid process is in the startup mode when additional heating of the catalyst in the converter is needed. The normal converter operating temperature is 800 ˚F and above. This equipment is used to start-up after turnarounds and after any shutdown when additional catalyst and converter heating is needed.

The combustion system for the furnace exhausts through the shell side of the preheat exchanger to the atmosphere. Process gas from the discharge of the main gas blower is directed through the tube side of the preheat exchanger and then into the converter. Once the catalyst/converter is adequately heated, the start-up heater system is shut down and bypassed.

Flare

The site has a flare with a pilot and gas assist with a rated capacity of 1.09 million BTUs per hour. The flare combusts exhaust from a caustic scrubber system treating vent gas, containing sulfur dioxide and potential VOCs, from truck and railcar unloading/loading facilities handling spent sulfuric acid. The caustic scrubber/flare system is also a backup

vent system for spent sulfuric acid storage tanks that normally vent to the sulfuric acid plant regeneration furnace.

Diesel Air Compressor

The diesel internal combustion engine drives a compressor utilized in the case of power outage to maintain safe pressure conditions in the acid plant. Normally, it is operated only for weekly testing; about 90 minutes per year. The use of this engine was terminated in 2017 but since it was tested that year, the testing emissions have been included in the ATIR.

Men's Changing Room Heaters

The men's changing room has both a natural gas water heater and a comfort unit. The water heater has a rated heat input of 76,000 BTUs/hr. and the comfort heating system is rated at 90,000 BTU/hr.

Maintenance Building Space Heaters

Ten natural gas-fired heaters are used in the maintenance building for workstation heating. The exhaust from these heaters are directed to a common location and discharged through a ridge vent that runs the length of the building along the roof centerline. One heater has a rated heat input of 30,000 BTUs/hr.; five are rated at 50,000 BTUs/hr. and four are rated at 100,000 BTUs/hr.

Main Office Building Heaters

The main office has 5 HVAC units fired by natural gas. Four of the units are rated at 100,000 BTU's/hr. and the other is rated at 90,000 BTUs/hr.

SVE Removal System

In the 1970's and 1980's, the facility transferred perchloroethylene (PCE) from railcars to storage tanks to trucks. A Soil Vapor Extraction (SVE) system was installed following closure of the storage tanks to remove PCE from the underlying soils. The system included an extraction well system, a blower, heat exchanger, water knock out tanks, and two carbon adsorption units arranged in series. The installation was conducted in accordance with an administrative agreement under the direction of the California Department of Toxic Substances Control (DTSC). The system became operational in the fourth quarter of 2016 and has continued to operate until recently. The facility is currently negotiating with DTSC to convert to a passive SVE system since the PCE removal rate have become asymptotic. When those negotiations are complete, Eco Services will update its Title V permit accordingly as also communicated and discussed with the permit engineer at SCAQMD. Since the system was in operation in 2017, emissions from the system are included in the ATIR. Monthly monitoring data, required as a condition under the SVE air permit, is used as the basis for the emissions estimate for this source and a summary of that information, used to develop SVE emissions estimates, is provided in Appendix D of this report.

4.4 Other Sources Not Included in the Air Toxics Inventory

Other sources at the facility that emit criteria pollutants are described below, along with the rationale behind why they were excluded from the air toxics inventory.

Gasoline Fueling

Historically, gasoline-dispensing units were employed to fuel company vehicles. In 2013, a financial analysis was conducted that showed it was more cost-effective to fuel company vehicles offsite. As a result, this tank was taken out of service in 2014 and its permit removed from the Title V permit. Documentation of their removal is contained in Appendix C of this report.

Cooling Towers

The Eco Services Dominguez facility has two cooling towers – the Plant 4 Cooling Tower (D16 in the permit) and the Turbo-generator Cooling Tower (E133 in the permit). The Plant 4 Cooling Tower supplies cooling water to various equipment in the sulfuric acid process,including week acid coolers, strong acid coolers the main gas blower turbine steam condenser, the main gas blower lube oil cooler, and air plant air compressors. The Turbo-generator Cooling Tower supplies cooling water to equipment in the Turbo-generator system, including, the air turbo-generator steam condenser, generator air coolers and generator system lube coolers.

Chromium-containing corrosion inhibitors have never been used in either cooling tower. In addition, since the Dominguez Plant processes inorganic chemicals, no VOCs are produced. Therefore, there are no air toxics associated with this source and its emissions are not included in the ATIR.

Aluminum Sulfate Plant

Emissions from the aluminum sulfate plant consist of a small quantity of aluminum trihydrate particulates released from a filter vent in the pneumatic unloading system. Since no toxics are contained in the particulate, this source was also excluded from the ATIR.

5.0 EMISSIONS CHARACTERIZATION

Section 5 provides a summary of emissions data utilized for the air toxics sources described in the previous section of the ATIR. Included in this section are:

- A listing of emission factors with the names of Toxic Air Contaminants and CAS numbers applicable to each source identified;
- Information on whether emissions are measured or estimated and references for each emission factor; and
- Calculation input data in terms of fuel usage, hours of operation or throughput (depending upon the emission factor employed).

Following these data, summary charts of emissions by source are provided for both annual average hourly emissions and maximum 1-hour emissions.

5.1 Emission Factors by Source

Table 3 presents emission factors by source type. Most of the emission factors utilized are from the AB2588 Reporting Guidance, Appendix A. The acid plant emission factors were derived from source test data (sulfuric acid) and feedstock specific engineering calculations (HCl). The SVE factor was developed from DTSC monitoring report data.

Table 3 - Emission Factors by Source

Source #	Permit ID	Process Description	CAS	TAC Name	Factor	Units	Emission Estimation Method
1	D1	Acid Plant Furnace	7664939	Sulfuric Acid	0.018	LB/TON OF H2SO4	Source Testing Result (Measured)
			7647010	Hydrochloric Acid	0.00018	LB/TON OF SPENT ACID FEED	Engineering Calculations Based on Trial Burn Data from Process-Specific Feedstock
2 & 3	D139	Package Boiler	71432	Benzene	0.0058	LB/MMSCF	AB2588 Reporting Guidance
	D98	Start-up Heater	50000	Formaldehyde	0.0123		Appendix B, Table B-1 Default EF
			1151	Total PAHs (excluding Naphthalene)	0.0001		for Natural Gas Combustion, Source: Boiler/Heater 10-100 MMBTU/Hr
			91203	Napthalene	0.0003		
			75070	Acetaldehyde	0.0031		
			107028	Acrolein	0.0027		
			7664417	Ammonia	3.2000		
			100414	Ethyl Benzene	0.0069		
			100543	Hexane	0.0046		
			108883	Toluene	0.0265		
			1330207	Xylenes	0.0197		
4	C126	Non-Refinery Flare	71432	Benzene	0.159	LB/MMSCF	AB2588 Reporting Guidance
			50000	Formaldehyde	1.169		Appendix B, Table B-1 Default EF
			1151	Total PAHs (excluding Naphthalene)	0.003		for Natural Gas Combustion, Source: Flare, Non-Refinery
			91203	Napthalene	0.011		
			75070	Acetaldehyde	0.043		
			107028	Acrolein	0.010		
			100414	Ethyl Benzene	1.444		
			100543	Hexane	0.029		
			108883	Toluene	0.058		
			1330207	Xylene	0.029		
5	D100	Diesel Air Compressor	71432	Benzene	0.1863	LB/1000 GAL	AB2588 Reporting Guidance
			106990	1,3-Butadiene	0.2174		Appendix B, Table B-2: Default EF
			7440439	Cadmium	0.0015		for Diesel/Distillate Fuel Combusion,
			50000	Formaldehyde	1.7261		Source: Stationary ICE
			18540299	Hexavalent Chromium	0.0001		
			7440382	Arsenic	0.0016		
			7439921	Lead	0.0083		
			7440020	Nickel	0.0039		
			1151	PAHs (excluding Napthalene)	0.0362		
			91203	Napthalene	0.0197		
			75070	Acetaldehyde	0.7833		
			107028	Acrolein	0.0339		
			77664417	Ammonia	0.8000		
			7440508	Copper	0.0041		
			100414	Ethyl Benzene	0.0109		
			110543	Hexane	0.0269		
			7647010	Hydrogen Chloride	0.1863		
			7439965	Manganese	0.0031		
			7439976	Mercury	0.0020		
			7782492	Selenium	0.0022		
			108883	Toluene	0.1054		
			1330207	Xylenes	0.0424		
			9901	Diesel Exhaust Particulates	33.5000		
6 thru 13	Exempt	Maintenance Building - Heaters	71432	Benzene	0.0080	LB/MMSCF	AB2588 Reporting Guidance
			50000	Formaldehyde	0.0170		Appendix B, Table B-1 Default EF
	Exempt	Water/Comfort Heaters - Men's Changing Room	1151	Total PAHs (excluding Naphthalene)	0.0001		for Natural Gas Combustion, Source: Heater <10 MMBTU/Hr
	Exempt	Main Office HVAC Units	91203	Napthalene	0.0003		
			75050	Acetaldehyde	0.0043		
			107028	Acrolein	0.0027		
			7664417	Ammonia	3.2000		
			100414	Ethyl Benzene	0.0095		
			100543	Hexane	0.0063		
			108883	Toluene	0.0366		
			1330207	Xylenes	0.0272		
14	DTSC Permit	SVE System	127814	Percholorethylene	9.24E-07	LB/SCF	Acute emission factor calculated from highest 2017 monitoring result*

* Annual emissions for chronic exposure were calculated from a material balance

5.2 Operating Assumptions by Source

Table 4 summarizes assumptions for daily, weekly and yearly operation by source. The acid plant is in operation 24 hours per day, 7 days per week, except during yearly maintenance operations (about two weeks per year on average). The non-refinery flare associated with the produced and spent acid loading and unloading also runs continuously. Both the package boiler and start-up heaters provide supplemental heat to the acid plant when necessary. The package boiler operated 240 hours in 2017.

In addition to supplemental heat, the start-up heater is utilized to bring the acid plant up to full capacity after turnarounds. It operated 175 hours in 2017, typically at 50% of rated capacity.

TABLE 4: Operating Assumptions By Source

Source	Hour/Day	Days/week	Weeks/Year	Comments
Acid Plant Furnace	24	7	50	The Acid Plant is shutdown two weeks per year for O&M
AVS Flare	24	7	52	The flare operates continuously
Package Boiler	24	1	10	Operated at 50% of design capacity for 240 hours
Start-Up Heater	15	1	8	Operated intermittently; 120 hours/year in 2017
Space Heaters	8	7	26	Utilized November through April on day shift only
Water Heater	24	7	52	Operates all months of the year
Diesel Air Compressor	2	1	1	ICE operates 2 hours/year for emergency testing
SVE System	24	7	28	The SVE system was in operation from January through February and August through December of 2017

The former diesel air compressor, still in use in 2017, was operated 1.9 hours that year. Those hours were associated with emergency equipment testing. Given the Mediterranean climate in Los Angeles, the space heaters are typically used during the winter months, November through April.

5.3 Fuel Use Data

Using the operating assumptions in Table 4, fuel use was allocated to specific equipment for the purpose of developing maximum hourly and annual average emission inputs for HARP. The fuel use data is summarized in Table 5.

Table 5: Fuel Use and Process Rate by Source

Device Number	Name	Permit ID	Eqpt Size	Eqpt Units	Annual Process Rate*	Maxiumum Hourly Process Rate**	SCC Units	Operating Hours		
								Hours per day	Days per week	Weeks per year
1	ACID PLANT No. 4	D1 - D17 / C148	-	-	480,420	60.417	Tons 100% H2SO4	24	7	50
1	ACID PLANT No. 4	D1 - D17 / C148	-	-	280,052	41.667	Tons of Spent Acid Feedstock	24	7	50
2	PACKAGE BOILER	D99 / D139	49	Million BTU	4.08	0.047	Million cubic feet burned	24	1	10
3	START-UP HEATER	D98	50	Million BTU	3.686	0.042	Million cubic feet burned	15	1	8
4	FLARE, NON-REFINERY	C126	1.09	Million BTU	2.5926	0.0905	Million cubic feet burned	24	7	52
5	AIR COMPRESSOR	D100	180	HP	0.01064	0.0056	1000 gallons burned	2	1	1
6	CHANGE ROOM - HEATER	EXEMPT	90,000	BTU	0.0429	8.571E-05	Million cubic feet burned	8	7	26
7	CHANGE ROOM - WATER HEATER	EXEMPT	76,000	BTU	0.0386	7.236E-05	Million cubic feet burned	24	7	52
8	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
9	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
10	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
11	MAIN OFFICE - HEATER	EXEMPT	100,000	BTU	0.025	9.524E-05	Million cubic feet burned	8	7	26
12	MAIN OFFICE - HEATER	EXEMPT	90,000	BTU	0.0225	8.571E-05	Million cubic feet burned	8	7	26
13	MAINTENANCE BLDG - HEATERS COMBINED	EXEMPT	680,000	BTU	0.1173	6.476E-04	Million cubic feet burned	8	7	26
14	SVE	DTSC PERMIT	-	-	70,560,000	15,000	Cubic feet	24	7	28

*Annual fuel records were used for all natural gas combustion sources; production data was used for the acid plant annual throughput; and the SVE operated only a portion of 2017. .
**Acid Plant process rate for H2SO4 and spend acide are shown separately

The package boiler and start-up heater have the largest consumption of natural gas. The non-industrial heaters and water heaters in the men's change room, main office and maintenance buildings have a collective rated capacity less than 1.4 MMBTU/hr.

5.4 Emission Summaries by Source

Using production rates (acid plant) and fuel usage data, emissions were developed for both maximum hour (for acute exposure purposes) and annual average emissions (for chronic exposure purposes). In terms of the industrial sources, during the maximum hour, it was assumed that all sources are operating. For annual emissions, the operating scenarios described above were utilized. For the non-industrial sources, the operating assumptions as described in Table 4 were utilized assuming that the maximum hour occurred during the day shift. Maximum hour and average annual emissions are summarized by both industrial and non-industrial source in Tables 6 and 7, respectively.

Table 6: Maximum Hourly and Annual Average Emissions by Source (Industrial)

Source #	Permit ID	Process Description	Pollutant	Maximum Hour		Annual Average	
				lbs/hr	g/sec	lbs/yr	g/sec
1	D1	Acid Plant Furnace	HCl	0.007500	0.00094498	50.40936	7.25E-04
			Sulfuric Acid	1.0875	0.13702199	8647.56	1.24E-01
2	D139	Package Boiler	Benzene	0.0002726	3.4347E-05	0.0236988	3.41E-07
			Formaldehyde	0.0005781	7.2839E-05	0.0502578	7.23E-07
			Total PAHs (excluding Naphthalene)	0.0000047	5.9219E-07	0.0004086	5.88E-09
			Naphthalene	0.0000141	1.7766E-06	0.0012258	1.76E-08
			Acetaldehyde	0.0001457	1.8358E-05	0.0126666	1.82E-07
			Acrolein	0.0001269	1.5989E-05	0.0110322	1.59E-07
			Ammonia	0.1504	0.01894998	13.0752	1.88E-04
			Ethyl Benzene	0.0003243	4.0861E-05	0.0281934	4.06E-07
			Hexane	0.0002162	2.7241E-05	0.0187956	2.70E-07
			Toluene	0.0012455	0.00015693	0.108279	1.56E-06
			Xylenes	0.0009259	0.00011666	0.0804942	1.16E-06
3	D98	Startup Heater	Benzene	0.0002	3.0693E-05	0.0214	3.07E-07
			Formaldehyde	0.0005	6.509E-05	0.0453	6.52E-07
			Total PAHs (excluding Naphthalene)	0.0000042	5.2919E-07	0.0003686	5.30E-09
			Naphthalene	0.0000126	1.5876E-06	0.0011058	1.59E-08
			Acetaldehyde	0.0001302	1.6405E-05	0.0114266	1.64E-07
			Acrolein	0.0001134	1.4288E-05	0.0099522	1.43E-07
			Ammonia	0.1344	0.01693403	11.7952	1.70E-04
			Ethyl Benzene	0.0002898	3.6514E-05	0.0254334	3.66E-07
			Hexane	0.0001932	2.4343E-05	0.0169556	2.44E-07
			Toluene	0.001113	0.00014023	0.097679	1.40E-06
			Xylenes	0.0008274	0.00010425	0.0726142	1.04E-06
4	C126	Non-Refinery Flare	Benzene	0.0143895	0.00181304	0.4122283	5.93E-06
			Formaldehyde	0.1057945	0.01332981	3.030786	4.36E-05
			Total PAHs (excluding Naphthalene)	0.0002715	3.4208E-05	0.00777789	1.12E-07
			Naphthalene	0.0009955	0.00012543	0.02851894	4.10E-07
			Acetaldehyde	0.0038915	0.00049032	0.1114831	1.60E-06
			Acrolein	0.001	0.00011403	0.026	3.73E-07
			Ethyl Benzene	0.130682	0.01646557	3.743759	5.38E-05
			Hexane	0.0026245	0.00033068	0.0751863	1.08E-06
			Toluene	0.005249	0.00066136	0.1503726	2.16E-06
			Xylenes	0.0026245	0.00033068	0.0751863	1.08E-06
5	D100	Diesel Air Compressor	Benzene	0.00104328	0.00013145	0.00198223	2.85E-08
			1,3-Butadiene	0.00121744	0.00015339	0.00231314	3.33E-08
			Cadmium	8.400E-06	1.0584E-06	0.00001596	2.30E-10
			Formaldehyde	0.00966616	0.00121791	0.0183657	2.64E-07
			Hexavalent Chromium	0.00000056	7.0558E-08	1.064E-06	1.53E-11
			Arsenic	0.00000896	1.1289E-06	1.7024E-05	2.45E-10
			Lead	0.00004648	5.8564E-06	8.8312E-05	1.27E-09
			Nickel	0.00002184	2.7518E-06	4.1496E-05	5.97E-10
			Total PAHs (excluding Naphthalene)	0.00020272	2.5542E-05	0.00038517	5.54E-09
			Naphthalene	0.00011032	1.39E-05	0.00020961	3.01E-09
			Acetaldehyde	0.00438648	0.00055268	0.00833431	1.20E-07
			Acrolein	0.00018984	2.3919E-05	0.0003607	5.19E-09
			Ammonia	0.0045	0.00056447	0.0085	1.22E-07
			Copper	0.00002296	2.8929E-06	4.3624E-05	6.27E-10
			Ethyl Benzene	0.00006104	7.6909E-06	0.00011598	1.67E-09
			Hexane	0.00015064	1.898E-05	0.00028622	4.12E-09
			HCl	0.00104328	0.00013145	0.00198223	2.85E-08
			Manganese	0.00001736	2.1873E-06	3.2984E-05	4.74E-10
			Mercury	0.0000	1.4112E-06	0.0000	3.06E-10
			Selenium	0.00001232	1.5523E-06	2.3408E-05	3.37E-10
			Toluene	0.00059024	7.4369E-05	0.00112146	1.61E-08
			Xylenes	0.00023744	2.9917E-05	0.00045114	6.49E-09
			Diesel Exhaust Particulates	0.1876	0.02363708	0.3564	5.13E-06
14	DTSC Permit	SVE Extaction System	Perchloroethylene	0.01386	0.00174632	4.3061	6.1936E-05

Table 7: Maximum Hourly and Annual Average Emissions by Source (Non-Industrial)

Source #	# of Units	Permit ID	Process Description	Rated Capacity	Pollutant	Maximum Hour lbs/hr	Maximum Hour g/sec	Annual Average lbs/yr	Annual Average g/sec
6	1	Exempt	Comfort Heater Men's Changing Room	90K BTU/hr	Benzene	6.8568E-07	5.18363E-06	0.0003432	4.855E-09
					Formaldehyde	1.45707E-06	1.10152E-05	0.0007293	6.294E-07
					Total PAHs (excluding Naphthalene)	8.571E-09	6.47953E-08	0.00000429	3.702E-09
					Naphthalene	2.5713E-08	1.94386E-07	0.00001287	1.111E-08
					Acetaldehyde	3.68553E-07	2.7862E-06	0.00018447	1.592E-07
					Acrolein	2.31417E-07	1.74947E-06	0.00011583	9.996E-08
					Ammonia	0.000274272	0.002073451	0.13728	1.185E-04
					Ethyl Benzene	8.14245E-07	6.15556E-06	0.00040755	3.517E-07
					Hexane	5.39973E-07	4.08211E-06	0.00027027	2.332E-07
					Toluene	3.13699E-06	2.37151E-05	0.00157014	1.355E-06
					Xylenes	2.33131E-06	1.76243E-05	0.00116688	1.007E-06
7	1	Exempt	Water Heater Men's Changing Room	76K BTU/hr	Benzene	5.79041E-07	4.37745E-06	0.0003088	7.665E-07
					Formaldehyde	1.23046E-06	9.30207E-06	0.0006562	5.663E-07
					Total PAHs (excluding Naphthalene)	7.238E-09	5.47181E-08	0.00000386	3.331E-09
					Naphthalene	2.1714E-08	1.64154E-07	0.00001158	9.993E-09
					Acetaldehyde	3.11234E-07	2.35288E-06	0.00016598	1.432E-07
					Acrolein	1.95426E-07	1.47739E-06	0.00010422	8.994E-08
					Ammonia	0.000231616	0.001750978	0.12352	1.066E-04
					Ethyl Benzene	6.8761E-07	5.19822E-06	0.0003667	3.165E-07
					Hexane	4.55994E-07	3.44724E-06	0.00024318	2.099E-07
					Toluene	2.64911E-06	2.00268E-05	0.00141276	1.219E-06
					Xylenes	1.96874E-06	1.48833E-05	0.00104992	9.061E-07
8	5	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
9	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
10	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
11	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	7.6192E-07	5.75999E-06	0.00019968	1.723E-07
					Formaldehyde	1.61908E-06	1.224E-05	0.00042432	3.662E-07
					Total PAHs (excluding Naphthalene)	9.524E-09	7.19999E-08	2.496E-06	2.154E-09
					Naphthalene	2.8572E-08	2.16E-07	7.488E-06	6.462E-09
					Acetaldehyde	4.09532E-07	3.09599E-06	0.00010733	9.262E-08
					Acrolein	2.57148E-07	1.944E-06	6.7392E-05	5.816E-08
					Ammonia	0.000304768	0.002303995	0.079872	6.893E-05
					Ethyl Benzene	9.0478E-07	6.83999E-06	0.00023712	2.046E-07
					Hexane	6.00012E-07	4.53599E-06	0.00015725	1.357E-07
					Toluene	3.48578E-06	2.63519E-05	0.00091354	7.884E-07
					Xylenes	2.59053E-06	1.9584E-05	0.00067891	5.859E-07
12	1	Exempt	Comfort Heater Main Office	100K BTU/hr	Benzene	6.8568E-07	5.18363E-06	0.00017968	1.551E-07
					Formaldehyde	1.45707E-06	1.10152E-05	0.00038182	3.295E-07
					Total PAHs (excluding Naphthalene)	8.571E-09	6.47953E-08	2.246E-06	1.938E-09
					Naphthalene	2.5713E-08	1.94386E-07	6.738E-06	5.815E-09
					Acetaldehyde	3.68553E-07	2.7862E-06	9.6578E-05	8.335E-08
					Acrolein	2.31417E-07	1.74947E-06	6.0642E-05	5.233E-08
					Ammonia	0.000274272	0.002073451	0.071872	6.203E-05
					Ethyl Benzene	8.14245E-07	6.15556E-06	0.00021337	1.841E-07
					Hexane	5.39973E-07	4.08211E-06	0.0001415	1.221E-07
					Toluene	3.13699E-06	2.37151E-05	0.00082204	7.094E-07
					Xylenes	2.33131E-06	1.76243E-05	0.00061091	5.272E-07
13	1	Exempt	Space Heater Maintenance Shop	30K BTU/hr (1 unit) 50 KBTU/hr (5 units) 100 KBTU/hr (4 units) (680 KBTU/hr combined) (Exhaust out of bldg ridge vent)	Benzene	5.18096E-06	3.91672E-05	0.0009384	8.098E-07
					Formaldehyde	1.10095E-05	8.32303E-05	0.0019941	1.721E-06
					Total PAHs (excluding Naphthalene)	6.4762E-08	4.8959E-07	0.00001173	1.012E-08
					Naphthalene	1.94286E-07	1.46877E-06	0.00003519	3.037E-08
					Acetaldehyde	1.72851E-07	9.28733E-07	0.00050439	4.353E-07
					Acrolein	1.74857E-06	1.32189E-05	0.00031671	2.733E-07
					Ammonia	0.002072384	0.015666878	0.37536	3.239E-04
					Ethyl Benzene	6.15239E-06	4.6511E-05	0.00111435	9.617E-07
					Hexane	4.0800E-06	3.08442E-05	0.00073899	6.377E-07
					Toluene	2.37029E-05	0.00017919	0.00429318	3.705E-06
					Xylenes	1.76153E-05	0.000133168	0.00319056	2.753E-06

The source of sulfuric acid and hydrochloric acid is the acid plant stack. The major combustion TACs emanate from the package boiler and startup heater. The air compressor contributes a minor source of diesel combustion TACs as it operated less than two hours in 2017. Emissions from the SVE unit, estimated with the assumption that the highest measured concentration was released over its entire 2017 operating schedule, contributed less than 4.3 lbs. of PCE.

Table 8 presents maximum hourly and total annual facility pollutants by TAC.

Table 8: Maximum hourly and Annual Emission by Air Toxic Pollutant

Pollutant	TAC ID	Pol ID	Annual lb/yr	Hr Max lb/hr
PAHs	19	1151	0.008972371	0.000483247
Diesel Exhaust PM	72	9901	0.35644	0.1876
Formaldehyde	12	50000	3.150206	0.11657699
Benzene	2	71432	0.461856932	0.015959159
Acetaldehyde	29	75070	0.145291342	0.008556689
Naphthalene	19	91203	0.031156478	0.001132902
Ethyl Benzene	40	100414	3.800552226	0.131369228
1,3-Butadiene	4	106990	0.002313136	0.00121744
Acrolein	30	107028	0.048138377	0.001338575
Toluene	68	108883	0.369204317	0.008244309
Hexane	44	110543	0.113246646	0.003192556
Perchloroethylene	18	127184	4.3061	0.01386
Xylenes	70	1330207	0.237479756	0.004649849
Lead	15	7439921	0.000088312	0.00004648
Manganese	49	7439965	0.000032984	0.00001736
Mercury	50	7439976	0.00002128	0.0000112
Nickel	17	7440020	0.000041496	0.00002184
Arsenic	14	7440382	0.000017024	0.00000896
Cadmium	5	7440439	0.00001596	8.4E-06
Copper	36	7440508	0.000043624	0.00002296
HCl	46	7647010	50.411342	0.008543
Ammonia	32	7664417	25.906432	0.293351616
Sulfuric Acid	67	7664939	8647.56	1.0875
Selenium	64	7782492	0.000023408	0.00001232
Chromium, Hexavalent	13	18540299	0.000001064	0.00000056

In the maximum hour, sulfuric acid and diesel exhaust particulate predominate. The terms of annual emissions, sulfuric acid is still the dominant pollutant, followed in descending order by perchloroethylene and ammonia.

6.0 REFERENCES

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LIST OF APPENDICES

A. **Sulfuric Acid Source Test Data Information**

B. **Hydrochloric Acid Emission Factor Information**

C. **Gasoline Tank Removal Documentation**

D. **Summary of SVE Monthly Monitoring Data and Emission Calculation Basis**